Rocky Flats Environmental Technology Site

Monthly Environmental Monitoring Report

EG&G ROCKY FLATS

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Rocky Flats Environmental
Technology Site
P. O. Box 464
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List of Tables

3

Table of Contents

List of Figures

4

During the May 16-17, 1995 precipitation event described above, the composite sampler at Pond C-1 was disabled due to extreme runoff conditions and safety concerns for electrical power in the area. The samples that had been collected on May 16th and 17th were lost and as a result, no analytical data are available for that period.

NPDES Sampling - Water sampling results associated with the NPDES/FFCA permit are presented in Tables 7, 8, and 9. No permit exceedances were reported during the month of May and all results are within expected ranges.

Daily Flow Data - Tables 10 through 12 present surface water flow data for the two onsite drainage systems, Walnut Creek and Woman Creek.

Groundwater Monitoring - Boundary well monitoring results are reported quarterly. Data for the Fourth Quarter of 1994 were presented in the April report. First Quarter 1995 data are scheduled to be presented in the July report.

Wind Direction Frequency - Table 13 presents wind direction data for the month of May.

Climatic Summary - Table 14 summarizes the climatic data for the month of May.

Rocky Flats Environmental Technology Site Monthly Environmental Monitoring Report

May Highlights

Summarized below are highlights for the major data categories presented in this report.

Airborne Effluent Calculations - Effluent air sampling results for the month of May are provided in Tables 1, 2, and 3. This month, the data for six uranium locations, five tritium locations, and one beryllium location are missing due to a failure of the quality assurance criteria. The uranium and tritium samples are being rerun and will be reported when they become available. No additional beryllium sample remained for a rerun; therefore, a six-month average has been substituted for the missing sample. All reported data are within expected ranges.

Ambient Air Sampling Results - Ambient air sampling results from the new Rocky Flats Radioactive Ambient Air Monitoring Program (RAAMP) sampling network are reported quarterly. Data for the First Quarter of 1995 were presented in the April report. Second Quarter 1995 are scheduled to be reported in July.

Onsite Surface Water Sample Results - Onsite surface water sample results for the month of May are presented in Tables 4, 5, and 6. At the time of reporting, 12 plutonium, one americium, one uranium, and six tritium analyses were incomplete due to quality assurance failures. These samples are being rerun and will be reported when they become available.

On May 16-17, 1995, the volume of water generated by a significant precipitation event required emergency discharges from all three terminal ponds. On May 17, 1995, a direct discharge was initiated from Pond B-5 via outlet works, and pumped discharge was initiated from Pond A-4. In addition, a pumped transfer of Pond C-2 to the Broomfield Diversion Ditch was initiated on May 18, 1995. Discharges from all terminal ponds continued throughout the month of May. As discussed in the Highlights of the April report, heavy precipitation precluded the normal predischarge sampling that routinely occurs between the Colorado Department of Public Health and Environment (CDPHE) and the Site prior to pond releases; however, samples were collected at the initiation of the discharges by both CDPHE and the Site.

6

Appendix B lists the Volatile Organic Compounds (VOCs) for which monitoring is required under the National Pollutant Discharge Elimination System/Federal Facility Compliance Agreement (NPDES/FFCA). Appendix C describes the Colorado Water Quality Control Commission (CWQCC) standards for the Walnut Creek and Woman Creek drainages downstream of Rocky Flats.

Error terms in the form of "a+b" are included with some of the data. For a single sample, "a" is the analytical-blank corrected value; for multiple samples it represents the arithmetic mean, the volume-weighted mean, or the annual total, as indicated in the table. The error term "b" accounts for the propagated statistical counting uncertainty of the sample(s) and the associated analytical blanks at the 95 percent confidence level. These error terms represent a minimum estimate of error for the data.

Measured concentrations of plutonium, uranium, americium, tritium, and beryllium are presented in this report. Most of the measured concentrations are at or very near background levels, and often there is little or no amount of these materials in the media analyzed. When this occurs, the results of the laboratory analysis can be expected to show a statistical distribution of positive and negative numbers near zero and numbers that are less than the calculated minimum detectable concentration for the analysis. The laboratory analytical blanks, used to correct for background contributions to the measurements, show a similar statistical distribution around their average values. Negative sample values result when the measured value for a laboratory analytical blank is subtracted from a sample analytical result smaller than the analytical blank value. Results that are less than calculated minimum detectable levels indicate that the results are below the level of statistical confidence in the actual numerical values. All reported results, including negative values and values that are less than minimum detectable levels, are included in any arithmetic calculations on the data set. Reporting all values allows all of the data to be evaluated using appropriate statistical treatment. This assists in identifying any bias in the analysis, allows better evaluation of distributions and trends in environmental data, and helps in estimating the true sensitivity of the measurement process.

The reader should use caution when interpreting individual values that are negative or less than minimum detectable levels. A negative value has no physical significance. Values less than

7

1. Introduction

The Rocky Flats Environmental Technology Site (Site or Rocky Flats) has been part of a nationwide Department of Energy (DOE) complex for the research, development, and production of nuclear weapons. The Site was responsible for fabricating nuclear weapons components from plutonium, uranium, beryllium, and stainless steel. The primary production activities included metal fabrication and assembly, chemical recovery and purification of process-produced transuranic radionuclides, and related quality control functions.

This mission changed with the announcement in early 1992 that certain planned weapons systems had been canceled. Rocky Flats no longer produces weapons components, and is now in a transition phase into decontamination and decommissioning (D&D). Primary objectives of this new mission include achieving and maintaining compliance with environmental regulatory requirements, as well as effecting proper D&D steps that are under development.

Because radioactive and chemically hazardous materials may be used or handled at Rocky Flats during transition, the Site maintains an extensive environmental protection program. Included in this program is regular monitoring for radioactive and hazardous constituents at locations onsite, offsite, and at the Site boundary.

Data presented in this report reflect the best information available to Rocky Flats at this time. If subsequent analyses indicate that any data presented herein are inaccurate or misleading, revisions will be issued promptly.

The Highlights section summarizes the major data categories presented in this report. All remaining data are within the ranges historically measured for their respective parameters and locations.

Radiation standards for protection of the public are discussed in Appendix A of this report. The primary standards are based on calculations of radiation dose. These calculations are performed annually using monitoring data presented in this report. Radiation doses to the public from Rocky Flats operations are typically well below any regulatory limit and far less than doses received from naturally occurring radiation sources in the Denver metropolitan area.

8

minimum detectable levels lack statistical confidence as to what the actual number is, although it is known with high confidence that it is below the specified detection level. Such values should not be interpreted as being the actual amount of material in the sample, but should be seen as reflecting a range (from zero to the minimum detectable level) in which the actual amount would likely lie. These values are significant, however, when taken together with other analytical results that indicate that the distribution is near zero.

The data in this report are provided as a matter of courtesy and should not be construed as an application for a permit or license, or in support of such an application. Approval from DOE should be obtained before publication of any data contained in this report.

Abbreviations used within this report are as defined.

Abbreviations

BOD_5	Biochemical Oxygen Demand, 5-day test
C Average	Average concentration
$CBOD_5$	Carbonaceous Biochemical Oxygen Demand, 5-day test
C Maximum	Maximum concentration
C Minimum	Minimum concentration
EFF	Efficiency
LC_{50}	Lethal concentration to 50 percent of the organisms
m^3	Cubic meter
m/s	Meters per second
mCi	Millicurie
mg/l	Milligrams per liter
mrem	Millirem
pCi/l	Picocuries per liter
pCi/m^3	Picocuries per cubic meter
pH	Hydrogen ion concentration
SU	Standard Unit
$\mu g/m^3$	Micrograms per cubic meter
#/100 ml	Number per 100 milliliter
μCi	Microcurie
$\mu g/l$	Micrograms per liter

9

At the end of every month, individual samples from each exhaust system are composited by location. An aliquot of each dissolved composite sample is analyzed for beryllium particulate materials. The remainder of the dissolved sample is subjected to radiochemical separation and alpha spectral analysis that quantifies specific alpha-emitting radionuclides. Analysis for uranium isotopes are conducted for each composite sample.

Forty-one of the ventilation exhaust systems are located in buildings where plutonium processing is conducted. Particulate material samples from these exhaust systems are analyzed for specific isotopes of plutonium and americium. Typically, americium contributes only a small fraction of the total alpha activity release from Rocky Flats.

Processes ventilated from several exhaust systems potentially exhibit trace quantities of tritium contamination. Impinger-type samplers are used to collect samples three times each week from the monitored locations. Tritium concentrations in the sample are measured using a liquid scintillation photospectrometer.

The calibration methodology for the beryllium analysis was changed beginning with the September 1990 samples to improve quality assurance. The previous procedure used the single-point, "simple method of additions," one of the methods recommended by the manufacturer of the graphite furnace atomic absorption analytical equipment. The current method is based on EPA Contract Laboratory Program protocol. It uses multi-point calibration curves, periodic validation of the curve with EPA validation standards, and periodic blank and sample checks to ensure absence of equipment contamination and matrix effects during the analysis.

Tables 1, 2, and 3 show monitoring results for radioactive and nonradioactive airborne effluents continuously sampled from buildings at Rocky Flats.

10

2. Air

2.1 Airborne Effluent

Rocky Flats continuously monitors radionuclide air emissions at 53 locations in 17 buildings. The requirements outlined in the "General Environmental Protection Programs" (DOE Order 5400.1) and the "National Emission Standards for Emissions of Radionuclides Other Than Radon From DOE Facilities" (40 CFR 61, Subpart H), mandate the continuous monitoring of air emissions at all release points with the potential of discharging radionuclides into the air in quantities that could result in an effective dose equivalent (EDE) greater than 0.1 millirem per year.

The radiological particulate monitoring and sampling program uses a three-tier approach comprising Selective Alpha Air Monitors (SAAMs), total long-lived alpha screening of routine air duct emission sample filters, and radiochemical analysis of isotopes collected from air duct emission samples. This approach balances both sensitivity and timeliness of desired results. Figure 1 shows a typical radiological emission sampler configuration within an exhaust duct.

For immediate detection of abnormal conditions, building ventilation systems that service areas containing plutonium are equipped with SAAMs. SAAMs are sensitive to specific alpha particle energies and are set to detect plutonium-239 and -240. These detectors are subjected to daily operational checks, monthly performance testing and calibration for airflow, and an annual radioactive source calibration to maintain sensitivity and reliability. Monitors alarm automatically if out-of-tolerance conditions are experienced.

At regular intervals, particulate material samples from a continuous sampling system are removed from each exhaust system and radiometrically analyzed for long-lived alpha and beta emitters. The concentration of long-lived alpha and beta emitters is indicative of effluent quality and overall performance of the High Efficiency Particulate Air (HEPA) filtration system. If the total long-lived alpha concentration for an effluent sample exceeds the Rocky Flats action value of 0.02 pCi/m^3, a follow-up investigation is conducted to determine the cause and to evaluate the need for corrective action. The action value is equal to the most restrictive offsite Derived Concentration Guide (DCG) for plutonium activity in air.

Table 1

Plutonium and Americium Airborne Effluent Data

Month	Plutonium-239, -240 (04/13/95 - 05/16/95) Release (µCi)			C Maximum (pCi/m³)			Americium-241 (03/13/95 - 04/14/95) Release (µCi)			C Maximum (pCi/m³)		
CY1994	0.1874	±	0.0234	0.0007	±	0.0001	0.1093	±	0.0407	0.0002	±	0.0001
1995												
January	0.0041	±	0.0013	0.0000	±	0.0000	-0.0018	±	0.0017	0.0000	±	0.0000
February	0.0148	±	0.0017	0.0004	±	0.0000	0.0056	±	0.0025	0.0004	±	0.0001
March	0.0511	±	0.0061	0.0064	±	0.0006	0.0074	±	0.0026	0.0003	±	0.0001
April	0.0669	±	0.0080	0.0032	±	0.0003	0.0066	±	0.0020[a]	0.0002	±	0.0000
May	0.0090	±	0.0014	0.0001	±	0.0000	0.0054	±	0.0021[b]	0.0000	±	0.0000
Year to Date	0.1460	±	0.0184	0.0064	±	0.0006	0.0231	±	0.0108	0.0004	±	0.0001

a Previously reported as incomplete data.
b The data from the 45 americium locations are being reported one month in arrears.

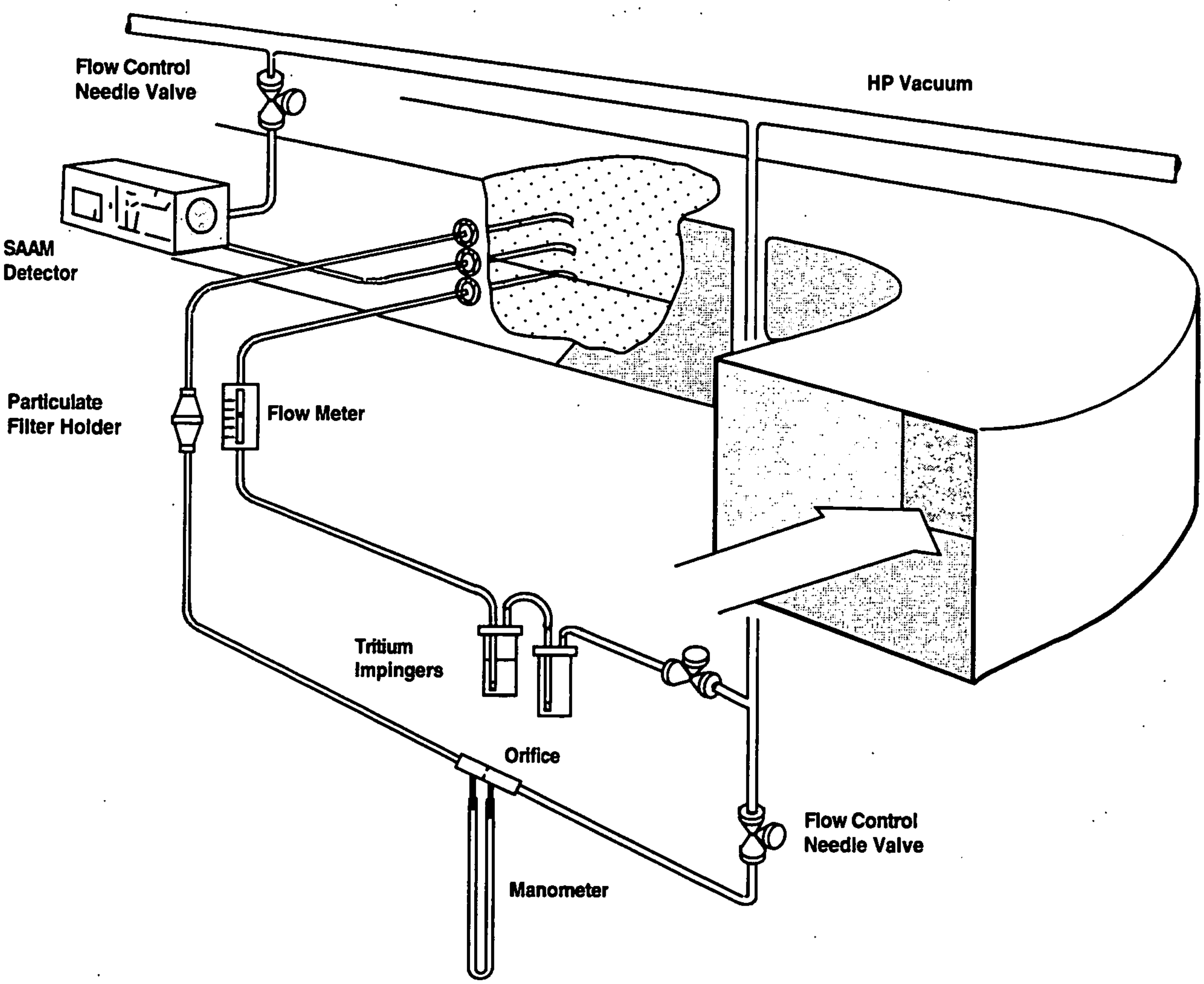


Figure 1: Radiological Effluent Air Sampling System

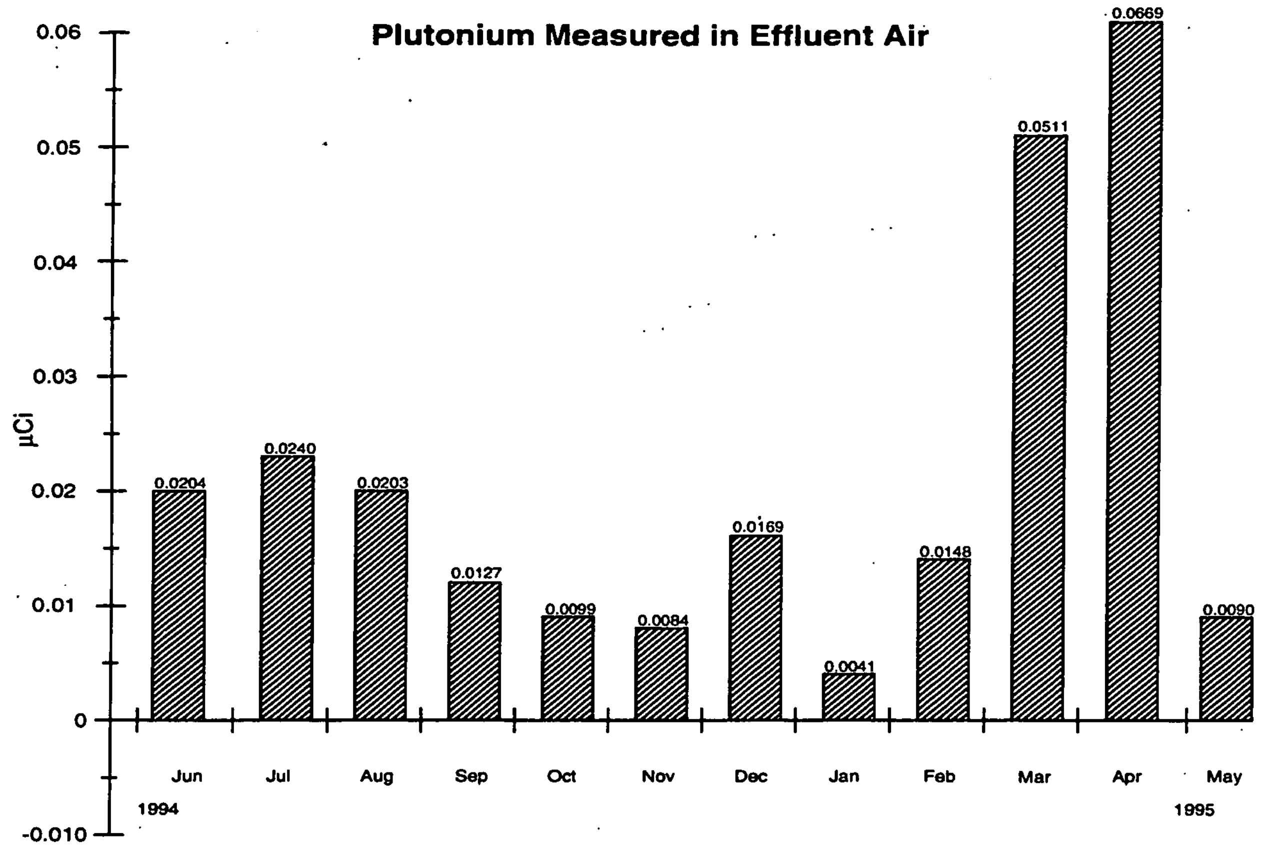
Table 2

Uranium Airborne Effluent Data

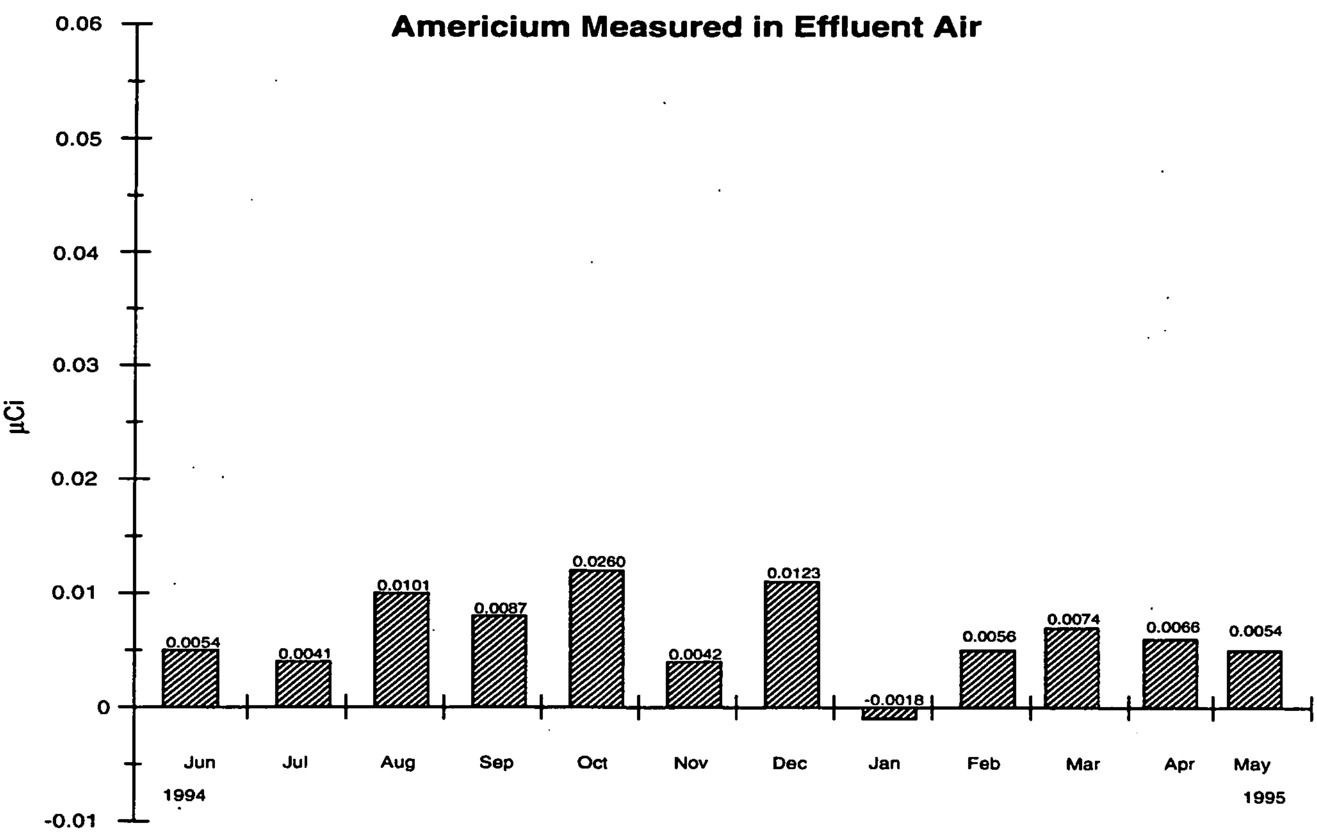
Month	Uranium-233, -234 (04/13/95 - 05/16/95) Release (µCi)			C Maximum (pCi/m^3)			Uranium-238 (04/13/95 - 05/16/95) Release (µCi)			C Maximum (pCi/m^3)		
CY1994	1.1399	±	0.1248	0.0006	±	0.0001	1.4210	±	0.1301	0.0012	±	0.0002
1995												
January	-0.0378	±	0.0076	0.0000	±	0.0000	-0.0381	±	0.0076	0.0003	±	0.0001
February	0.0934	±	0.0101	0.0004	±	0.0001	0.1181	±	0.0108	0.0004	±	0.0001
March	0.0652	±	0.0092	0.0002	±	0.0001	0.0765	±	0.0095	0.0002	±	0.0000
April	0.1070	±	0.0126 [a]	0.0002	±	0.0000	0.1162	±	0.0123 [a]	0.0003	±	0.0001
May	0.0858	±	0.0123 [b]	0.0002	±	0.0001	0.1041	±	0.0125 [b]	0.0007	±	0.0001
Year to Date	0.3136	±	0.0518	0.0004	±	0.0001	0.3769	±	0.0527	0.0007	±	0.0001

a Previously reported as incomplete data.

b The data for nine uranium locations are missing due to failure of quality assurance criteria. The samples are being reun.



Plutonium Measured in Effluent Air
µCi
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.010
0.0204
0.0240
0.0203
0.0127
0.0099
0.0084
0.0169
0.0041
0.0148
0.0511
0.0669
0.0090
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1994
1995



Americium Measured in Effluent Air
µCi
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
0.0054
0.0041
0.0101
0.0087
0.0260
0.0042
0.0123
-0.0018
0.0056
0.0074
0.0066
0.0054
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1994
1995

15

Table 3

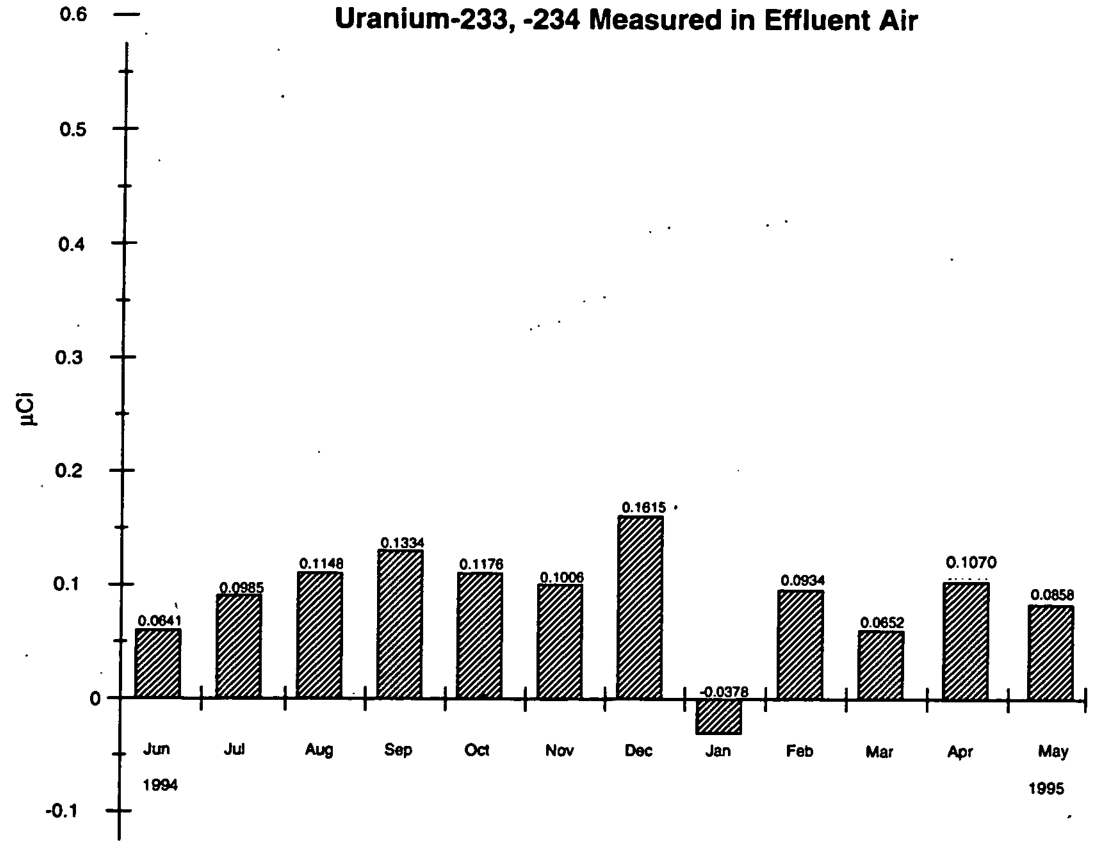
Tritium and Beryllium Airborne Effluent Data

Month	Tritium (H-3) (04/28/95 - 05/30/95) Release (mCi)	C Maximum (pCi/m^3)			Beryllium (04/13/95 - 05/16/95) Release (grams)			C Maximum ($\mu g/m^3$)
CY1994	3.2522	823	±	11	0.8137	±	0.0594	0.00083
1995								
January	0.4238	131	±	13	0.0763	±	0.0640	0.00021
February	0.0560	18	±	11	0.1089	±	0.0636	0.00016
March	0.1580	43	±	5	0.1570	±	0.1029	0.00033
April	0.3000 [a]	58	±	22	0.1636	±	0.0936 [a,b]	0.00038
May	0.2474 [c]	34	±	14	0.1336	±	0.0920	0.00026
Year to Date	1.1852	131	±	13	0.6394	±	0.0416	0.00038

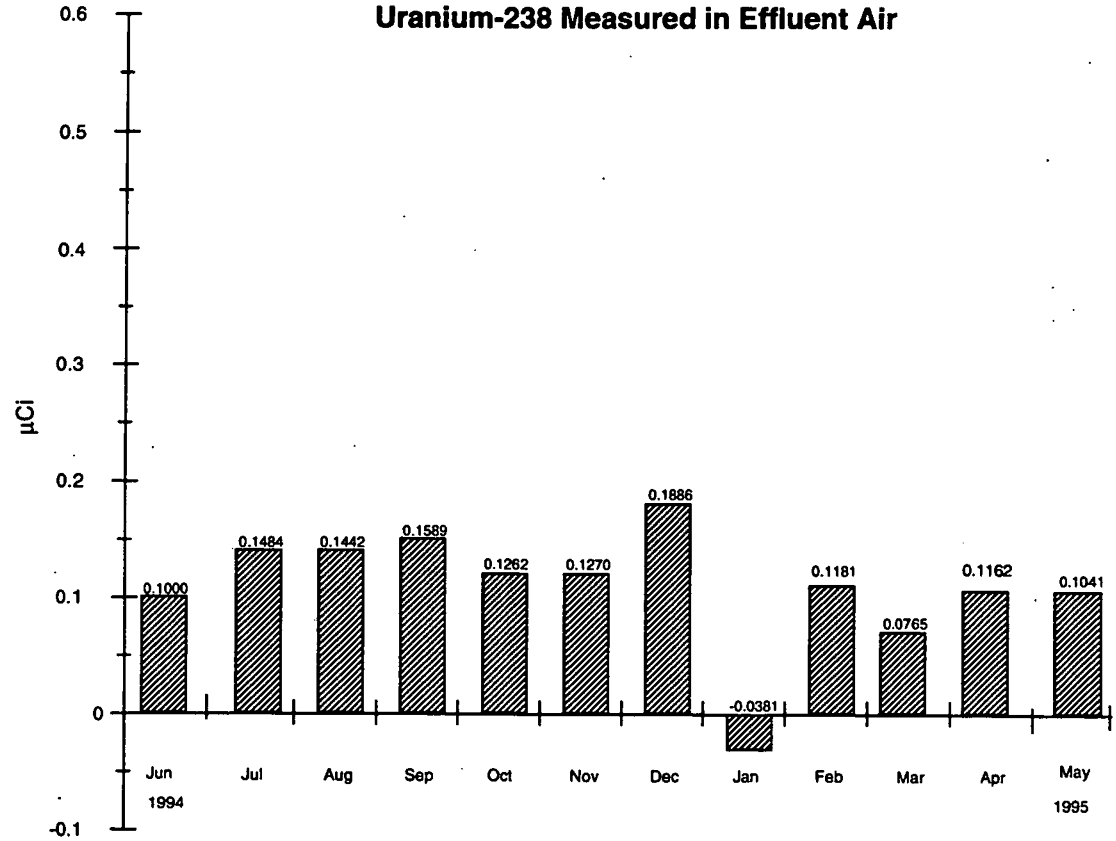
NOTE: Beryllium measured at the remaining 10 locations was below the screening level of 0.1 gram per month. Beryllium emissions from the Site are regulated by the State of Colorado under Colorado Air Quality Control Regulation #8. The limit for beryllium air emissions is 10 grams per stationary source in a 24-hour period. No blank corrections are made to any beryllium data.

a Previously reported as incomplete data.
b The data for one beryllium sample is missing due to failure of quality assurance criteria and no additional sample remains for a rerun. A six month average has been substituted for the missing sample.
c The data for five tritium samples are missing due to failure of quality assurance criteria. The samples are being rerun.

16



Uranium-233, -234 Measured in Effluent Air
µCi
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0.0641
0.0985
0.1148
0.1334
0.1176
0.1006
0.1615
-0.0378
0.0934
0.0652
0.1070
0.0858
Jun
1994
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1995



Uranium-238 Measured in Effluent Air
µCi
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0.1000
0.1484
0.1442
0.1589
0.1262
0.1270
0.1886
-0.0381
0.1181
0.0765
0.1162
0.1041
Jun
1994
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1995

17

2.2 Ambient

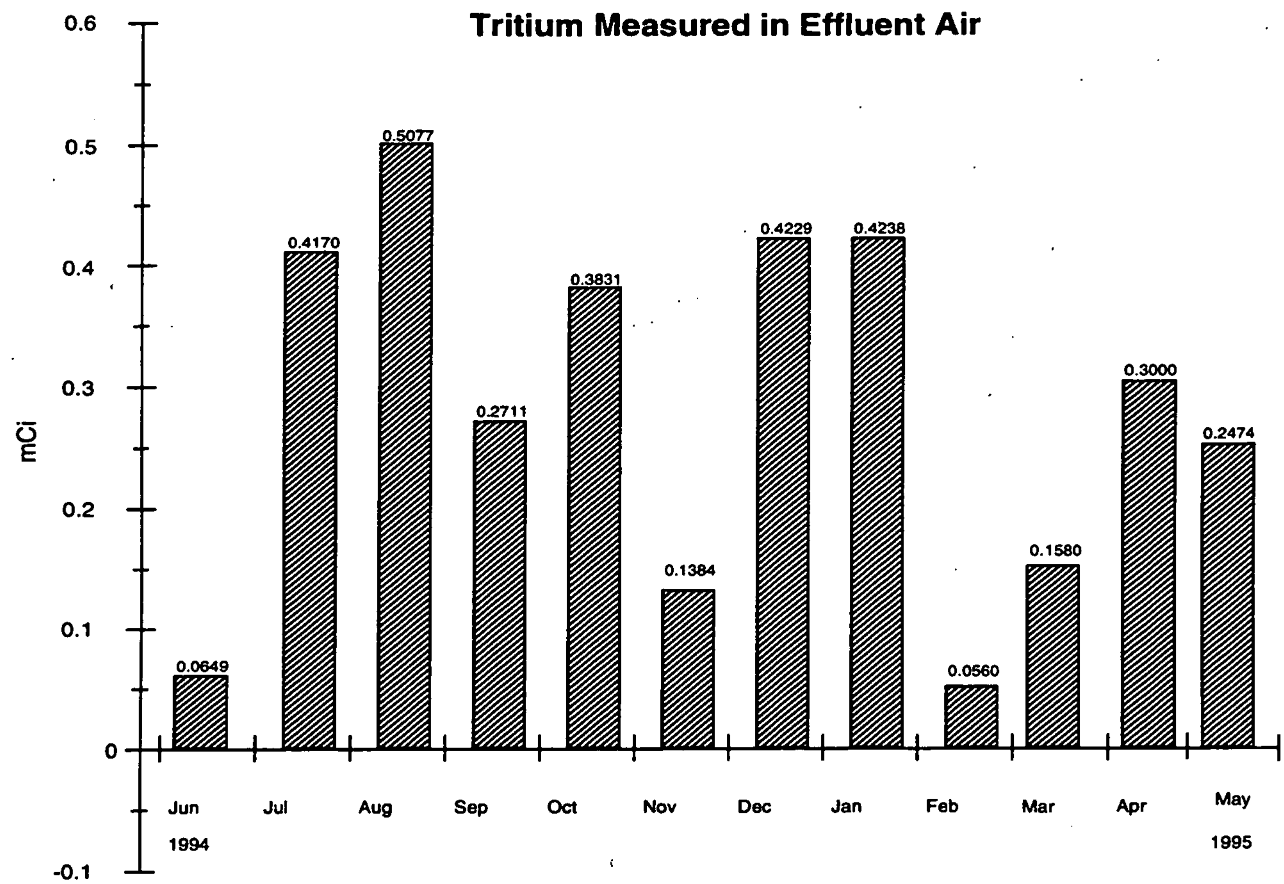
The Rocky Flats Radioactive Ambient Air Monitoring Program (RAAMP) is designed to monitor radioactive particles at near-background concentrations. This monitoring is performed in accordance with DOE Order 5400.1. The data are used to estimate the air-inhalation dose to the public resulting from routine Site operations, and to compare that dose with the DOE standard of 100 millirem per year effective dose equivalent (EDE).

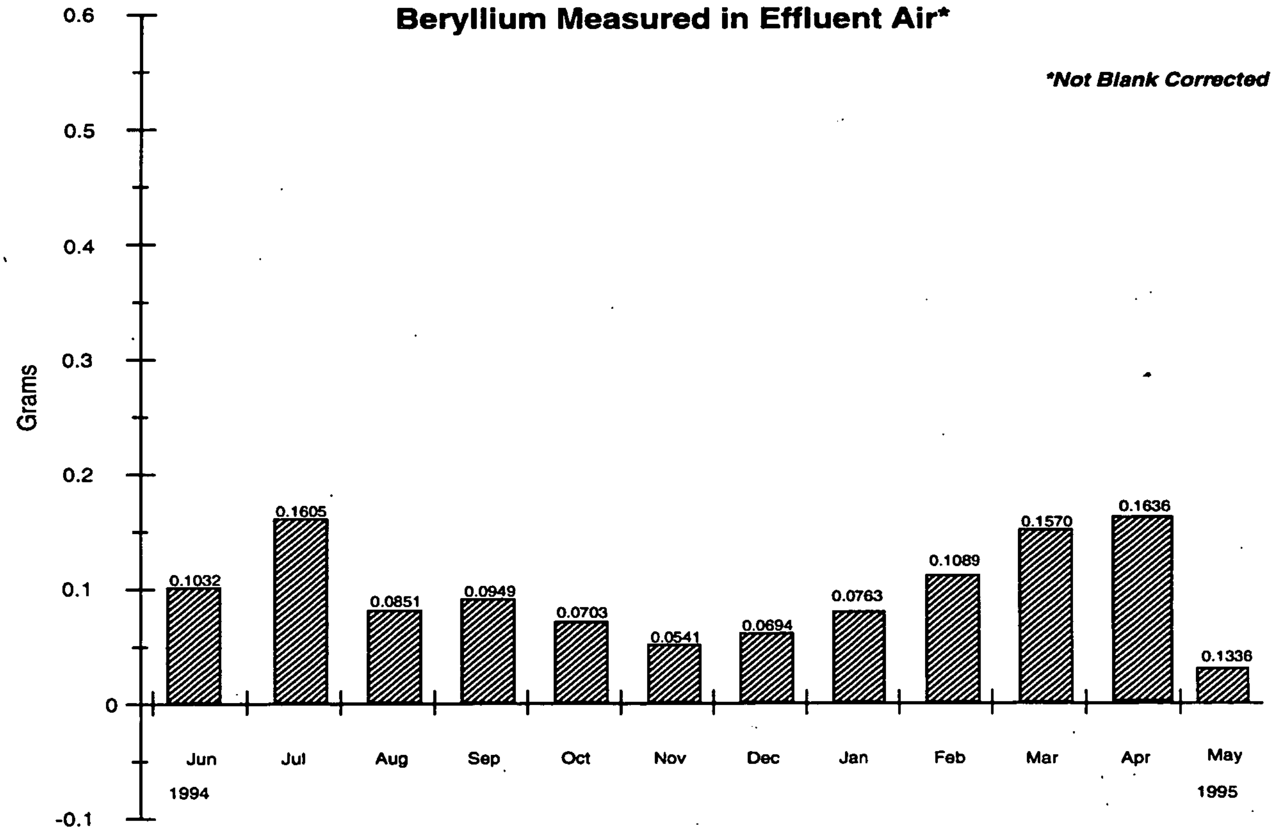
To replace the aging network of RAAMP samplers, Rocky Flats developed a new sampler that provides the ability to separate radioactive particles into two size ranges (one coarse, the other fine and respirable), and to retain them for analysis. The larger, coarse fraction is collected on an oiled impaction substrate; the fine fraction is collected on the same 20- by 25-centimeter fiberglass filters used on the pre-1994 samplers.

The new RAAMP samplers were installed during Calendar Year 1994 and became operational by the end of December. Ambient air filters are collected monthly from each location and composited quarterly for isotopic analysis. Data are presented one month behind each sampling quarter, and both the coarse and fine fractions are reported.

The sampling network is located on and around the Site, at 41 locations. Samplers are designated in four categories, according to their proximity to the main facilities area:

1. <u>Onsite Samplers</u> - Twenty-four samplers are located onsite, generally downwind of the production facilities areas and near areas of known plutonium contamination. Of the 24 samplers, 13 are new samplers at existing locations, 7 are new samplers at new locations, and 4 are old samplers (i.e., pre-1994 samplers), which will be left in place for at least one year to provide a basis for comparison with data collected from the new samplers. The 7 new locations have been added to support the Operable Units that require monitoring for suspended particles. Figure 2 shows the onsite sampler network.


Tritium Measured in Effluent Air
mCi
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0.0649
0.4170
0.5077
0.2711
0.3831
0.1384
0.4229
0.4238
0.0560
0.1580
0.3000
0.2474
Jun
1994
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1995


Beryllium Measured in Effluent Air*
*Not Blank Corrected
Grams
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0.1032
0.1605
0.0851
0.0949
0.0703
0.0541
0.0694
0.0763
0.1089
0.1570
0.1636
0.1336
Jun
1994
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
1995

19

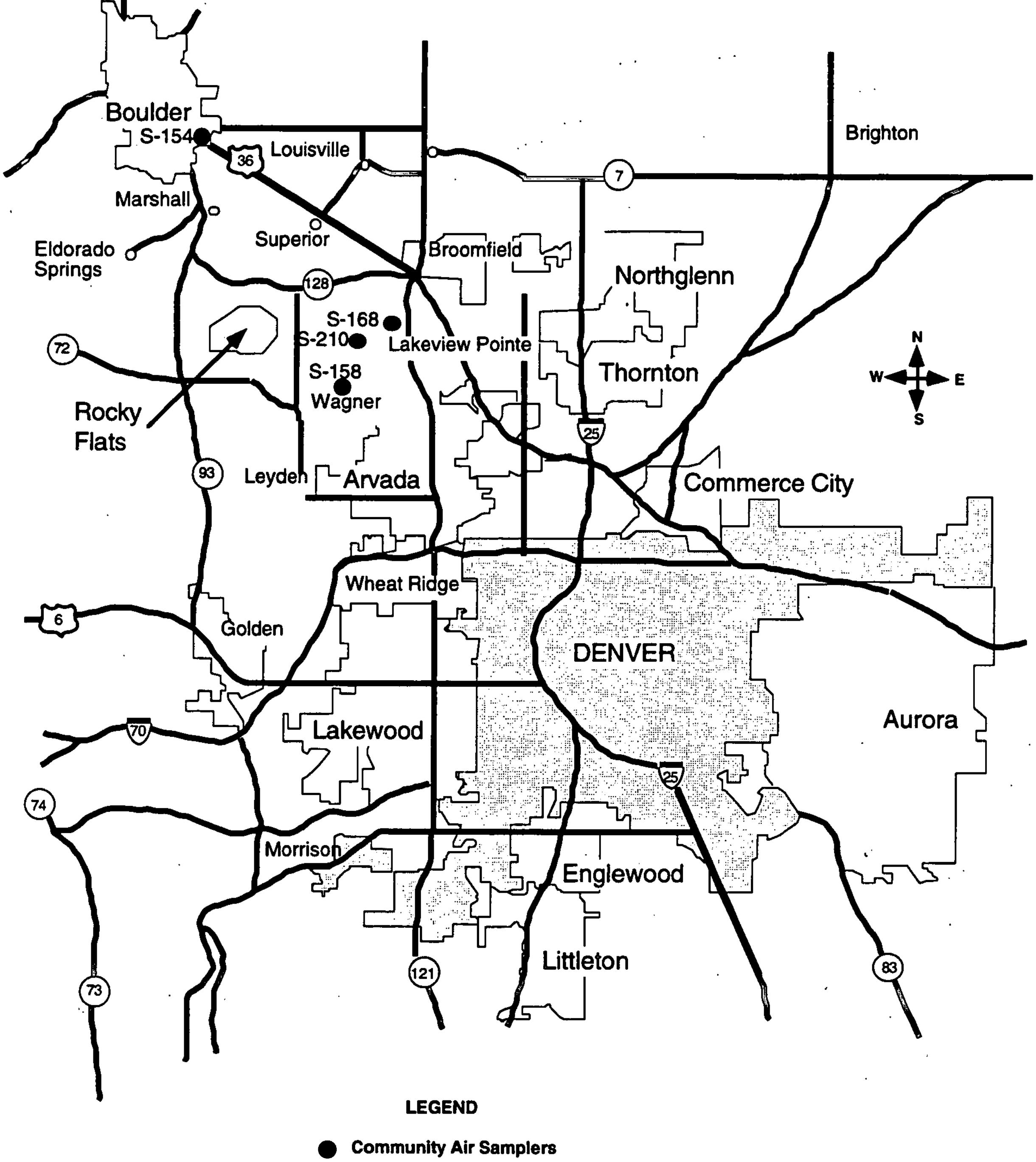


Figure 3: Location of Community Air Samplers

20

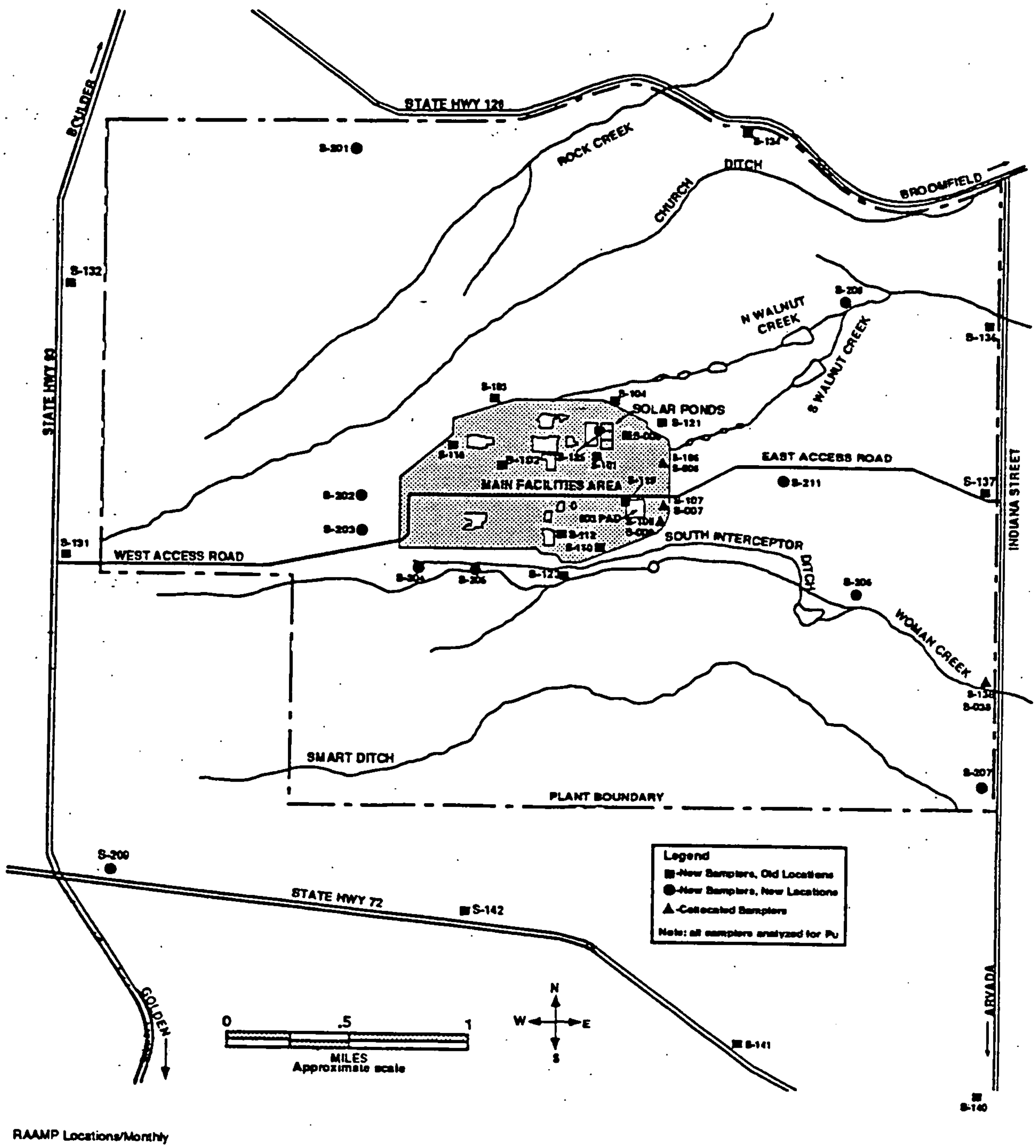


Figure 2: Location of Onsite and Perimeter Air Samplers

21

Ambient Air Data

Ambient air data from the new RAAMP sampler network are reported quarterly. Results from the First Quarter of 1995 were presented in the April 1995 Edition of the Monthly Environmental Monitoring Report. Second Quarter 1995 data are scheduled to be presented in the July 1995 report.

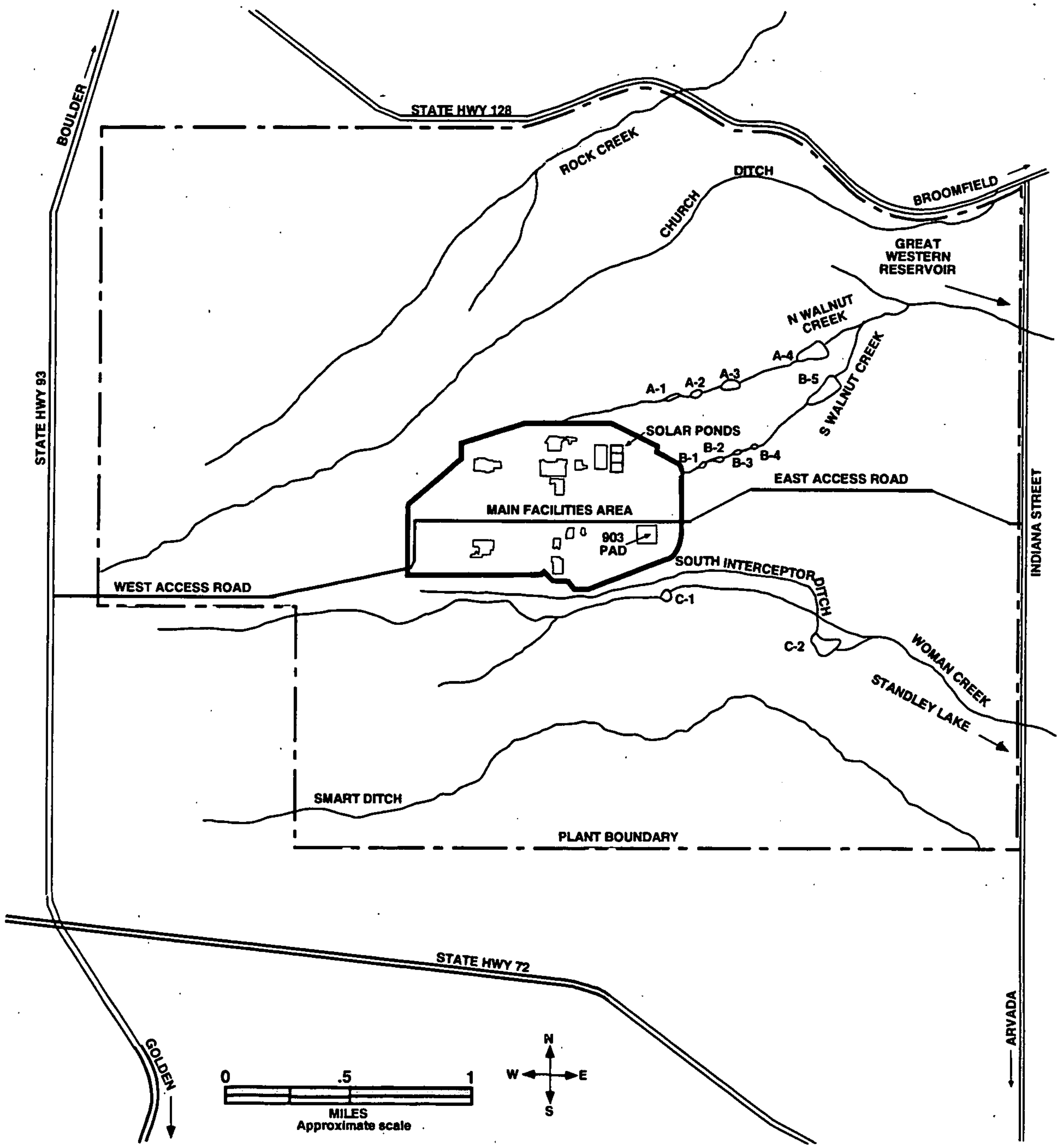
22

2. Perimeter Samplers - Thirteen perimeter samplers border Rocky Flats along highways on the north (Highway 128), east (Indiana Street), south (Highway 72), and west (Highway 93). Of the 13 perimeter samplers, 9 are new samplers at existing locations, 3 are new samplers at new locations, and one is an old sampler, which will be left in place to provide a basis for comparison with readings taken from the new samplers. Figure 2 shows the perimeter sampler network.

3. Community Samplers - Four community samplers are located in metropolitan areas adjacent to Rocky Flats. These samplers are supplemented by five additional samplers in the Community Radiation Monitoring Program (ComRad). Figure 3 shows the community sampler network.

4. Collocated Samplers - As described above, four existing onsite and perimeter samplers (i.e., pre-1994 samplers) will remain collocated with the new samplers for at least one year. Data from the collocated samplers will be analyzed monthly for comparison with results from the new samplers. Figure 2 shows the locations of the collocated samplers.

23



Note: Stream flow in the Rocky Flats area is to the east.

Figure 4: Holding Pond and Liquid Effluent Water Courses

24

3. Surface Water

3.1 Radionuclide

Rocky Flats samples for and analyzes radionuclides that may be present in the Site surface water control ponds and drinking water reservoirs. Radionuclide standards for discharge of surface water effluents are given in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." In addition, the CWQCC has issued stream segment standards for drainages downstream of Rocky Flats. These standards address both radioactive and nonradioactive parameters. Figure 4 shows the locations of holding ponds and liquid effluent water courses at Rocky Flats.

Surface water sampling is performed at several locations at Rocky Flats. These include Ponds A-4, B-5, C-1, and C-2, as well as Walnut Creek at Indiana Street. Daily samples are collected during discharges or periods of flow for these locations and composited into weekly samples. Analyses are then performed for plutonium, americium, and uranium isotopic concentrations.

Surface water sampling results for radioactive constituents are shown in Tables 4, 5, and 6.

25

Table 5

Onsite Surface Water Sample Results - Uranium

Holding Pond Outfall (pCi/l)

Location	Uranium-233, -234			Uranium-238		
Pond A-4						
04/29/95 - 05/05/95	0.97	±	0.12	1.10	±	0.13
05/09/95 - 05/09/95	1.13	±	0.16	1.31	±	0.18
05/17/95 - 05/19/95	0.98	±	0.18	0.95	±	0.18
05/20/95 - 05/26/95	0.99	±	0.14	1.11	±	0.16
05/27/95 - 06/02/95	1.05	±	0.14	1.08	±	0.14
Volume weighted average concentration	1.01	±	0.07	1.11	±	0.07
Pond B-5						
04/29/95 - 05/05/95	1.08	±	0.16	1.03	±	0.16
05/06/95 - 05/07/95	1.20	±	0.16	1.15	±	0.16
05/17/95 - 05/19/95	1.28	±	0.23	1.14	±	0.21
05/20/95 - 05/26/95	1.08	±	0.13	1.04	±	0.13
05/27/95 - 06/02/95	1.54	±	0.18	1.35	±	0.16
Volume weighted average concentration	1.23	±	0.09	1.14	±	0.08
Pond C-1						
04/29/95 - 05/05/95	0.29	±	0.05	0.23	±	0.04
05/06/95 - 05/12/95	0.58	±	0.12	0.55	±	0.11
05/18/95 - 05/21/95	0.34	±	0.07	0.27	±	0.06
05/22/95 - 05/26/95	0.40	±	0.06	0.37	±	0.06
Average concentration	0.40	±	0.12	0.35	±	0.14
Pond C-2						
05/18/95 - 05/19/95	1.02	±	0.21	1.41	±	0.28
05/20/95 - 05/26/95	1.15	±	0.15	1.60	±	0.20
05/27/95 - 06/02/95		a			a	
Volume weighted average concentration		a			a	
Walnut Creek at Indiana						
04/29/95 - 05/05/95	0.71	±	0.09	0.70	±	0.09
05/06/95 - 05/12/95	0.47	±	0.07	0.36	±	0.06
05/13/95 - 05/19/95	0.67	±	0.11	0.55	±	0.10
05/20/95 - 05/26/95	0.83	±	0.12	0.78	±	0.11
05/27/95 - 06/02/95	1.08	±	0.13	1.04	±	0.13
Volume weighted average concentration	0.74	±	0.05	0.68	±	0.04

a Incomplete lab analysis.

Table 4

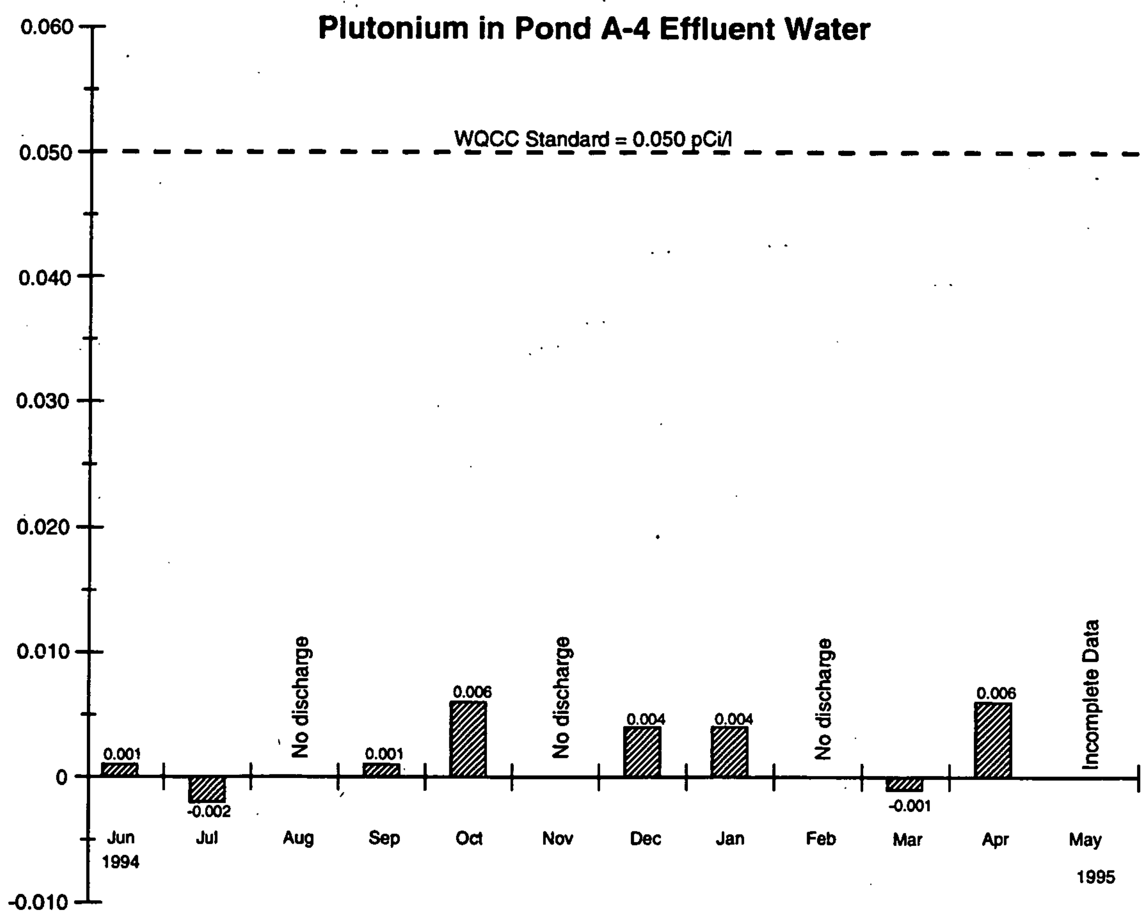
Onsite Surface Water Sample Results - Plutonium and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium-239, -240			Americium-241		
Pond A-4						
04/29/95 - 05/05/95	0.005	±	0.010	0.006	±	0.006
05/06/95 - 05/09/95	0.017	±	0.008	0.007	±	0.006
05/17/95 - 05/19/95		a			a	
05/20/95 - 05/26/95		a		0.013	±	0.007
05/27/95 - 06/02/95	0.014	±	0.012	0.017	±	0.008
Volume weighted average concentration		a			a	
Pond B-5						
04/29/95 - 05/05/95	0.019	±	0.013	0.013	±	0.007
05/06/95 - 05/07/95	0.021	±	0.020	-0.001	±	0.008
05/17/95 - 05/19/95		a		0.037	±	0.020
05/20/95 - 05/26/95		a		0.007	±	0.008
05/27/95 - 06/02/95	0.030	±	0.011	0.009	±	0.007
Volume weighted average concentration		a		0.016	±	0.006
Pond C-1						
04/29/95 - 05/05/95	-0.003	±	0.006	0.003	±	0.005
05/06/95 - 05/12/95	0.007	±	0.009	0.001	±	0.006
05/18/95 - 05/21/95		a		0.004	±	0.006
05/22/95 - 05/26/95		a		-0.002	±	0.003
Average concentration		a		0.002	±	0.003
Pond C-2						
05/18/95 - 05/19/95		a		0.065	±	0.022
05/20/95 - 05/26/95		a		0.022	±	0.012
05/27/95 - 06/02/95		a		0.020	±	0.009
Volume weighted average concentration		a		0.024	±	0.007
Walnut Creek at Indiana						
04/29/95 - 05/05/95	0.007	±	0.008	0.008	±	0.007
05/06/95 - 05/12/95	0.001	±	0.005	0.012	±	0.007
05/13/95 - 05/19/95		a			a	
05/20/95 - 05/26/95		a		0.006	±	0.007
05/27/95 - 06/02/95		a		0.010	±	0.007
Volume weighted average concentration		a			a	

a Incomplete lab analysis.

27


Plutonium in Pond A-4 Effluent Water
WQCC Standard = 0.050 pCi/l
pCi/l
0.060
0.050
0.040
0.030
0.020
0.010
0
-0.010
0.001
-0.002
No discharge
0.001
0.006
No discharge
0.004
0.004
No discharge
-0.001
0.006
Incomplete Data
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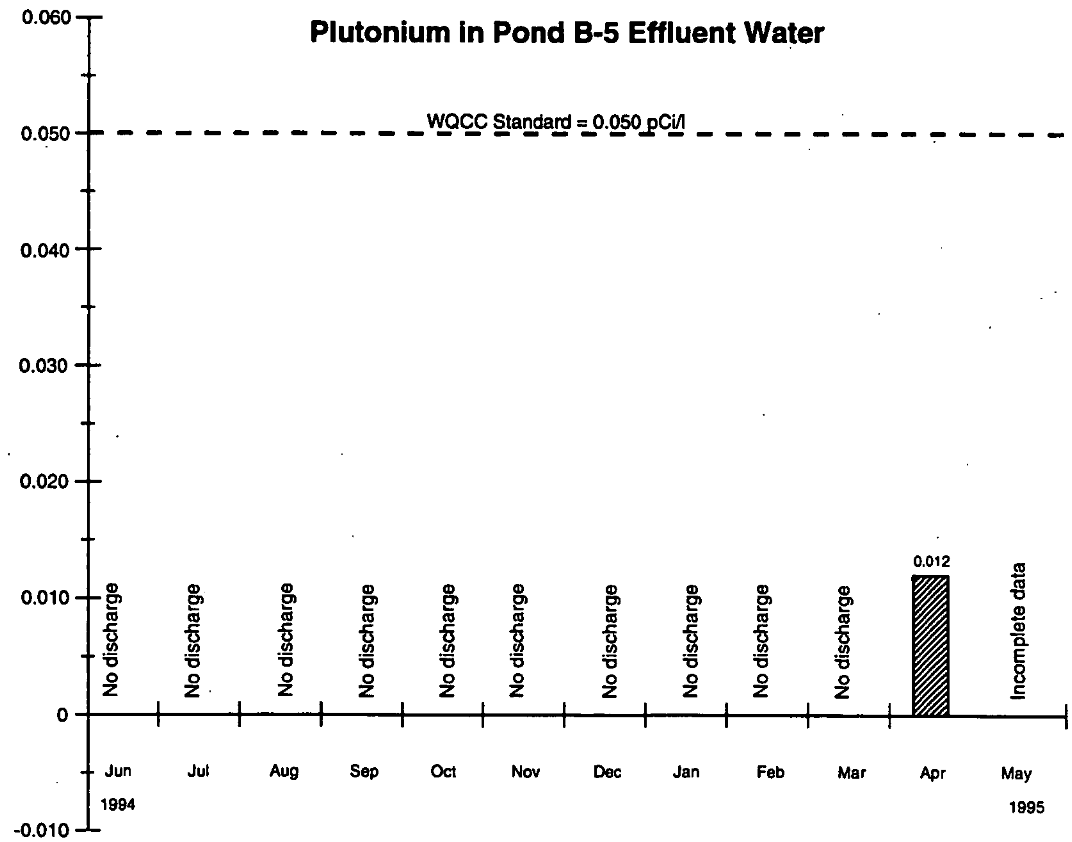
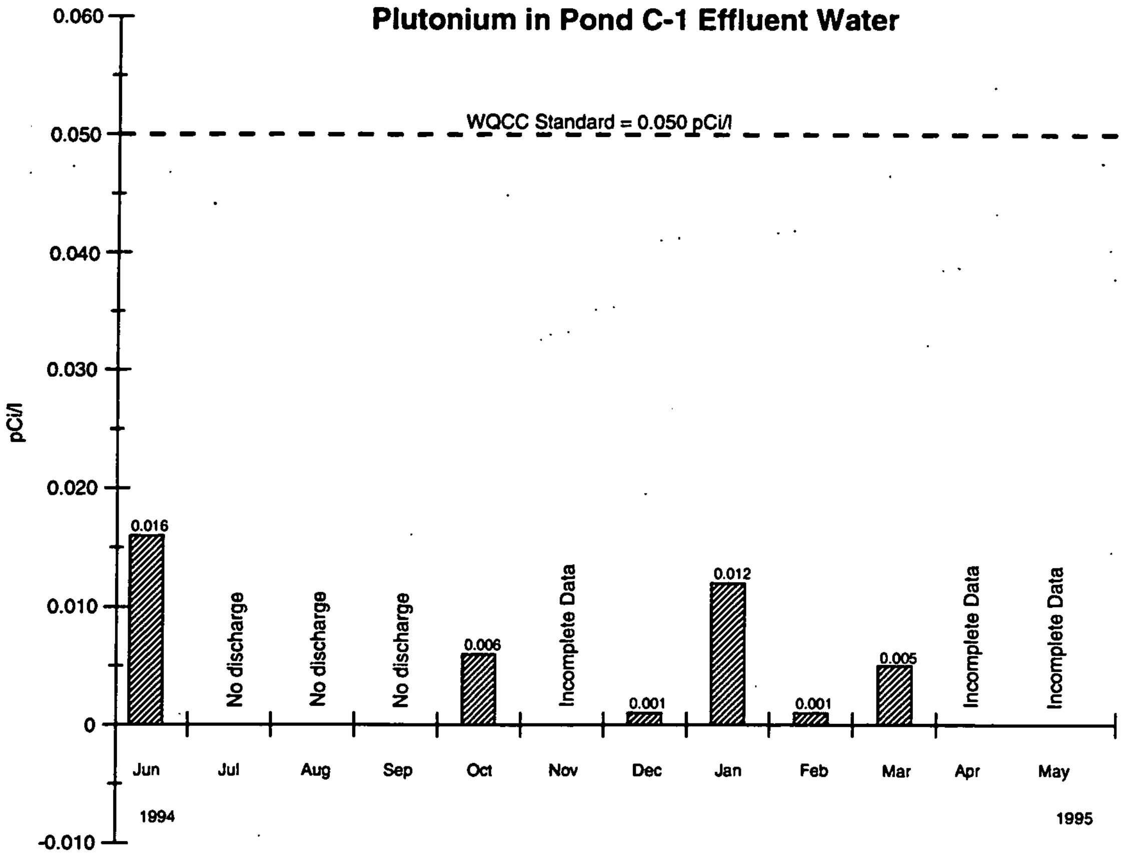
Jan
Feb
Mar
Apr
May 1995


Plutonium in Pond B-5 Effluent Water
WQCC Standard = 0.050 pCi/l
pCi/l
0.060
0.050
0.040
0.030
0.020
0.010
0
-0.010
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
0.012
Incomplete data
Jun 1994
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May 1995

28


Plutonium in Pond C-1 Effluent Water
WQCC Standard = 0.050 pCi/l
pCi/l
0.060
0.050
0.040
0.030
0.020
0.010
0
-0.010
0.016
No discharge
No discharge
No discharge
0.006
Incomplete Data
0.001
0.012
0.001
0.005
Incomplete Data
Incomplete Data
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Jul
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Sep
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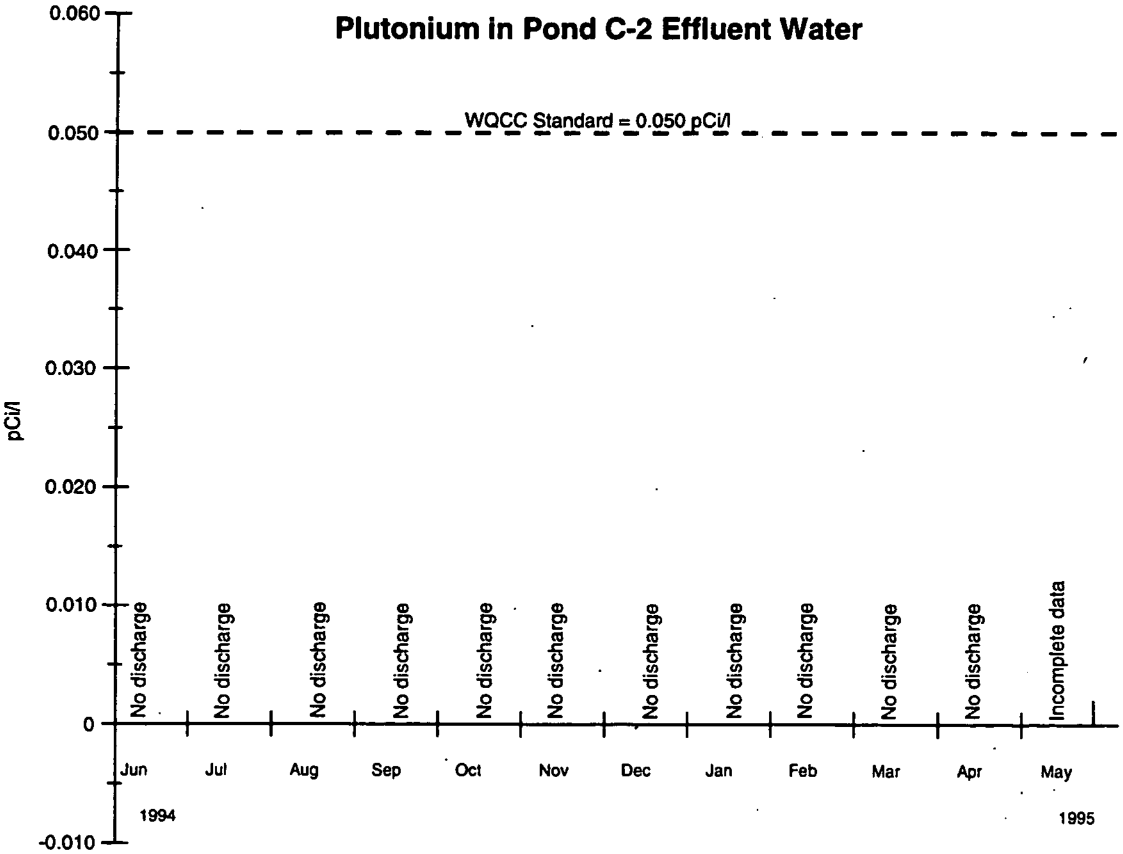
Nov
Dec
Jan
Feb
Mar
Apr
May
1994
1995


Plutonium in Pond C-2 Effluent Water
WQCC Standard = 0.050 pCi/l
pCi/l
0.060
0.050
0.040
0.030
0.020
0.010
0
-0.010
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
No discharge
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No discharge
Incomplete data
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1994
1995

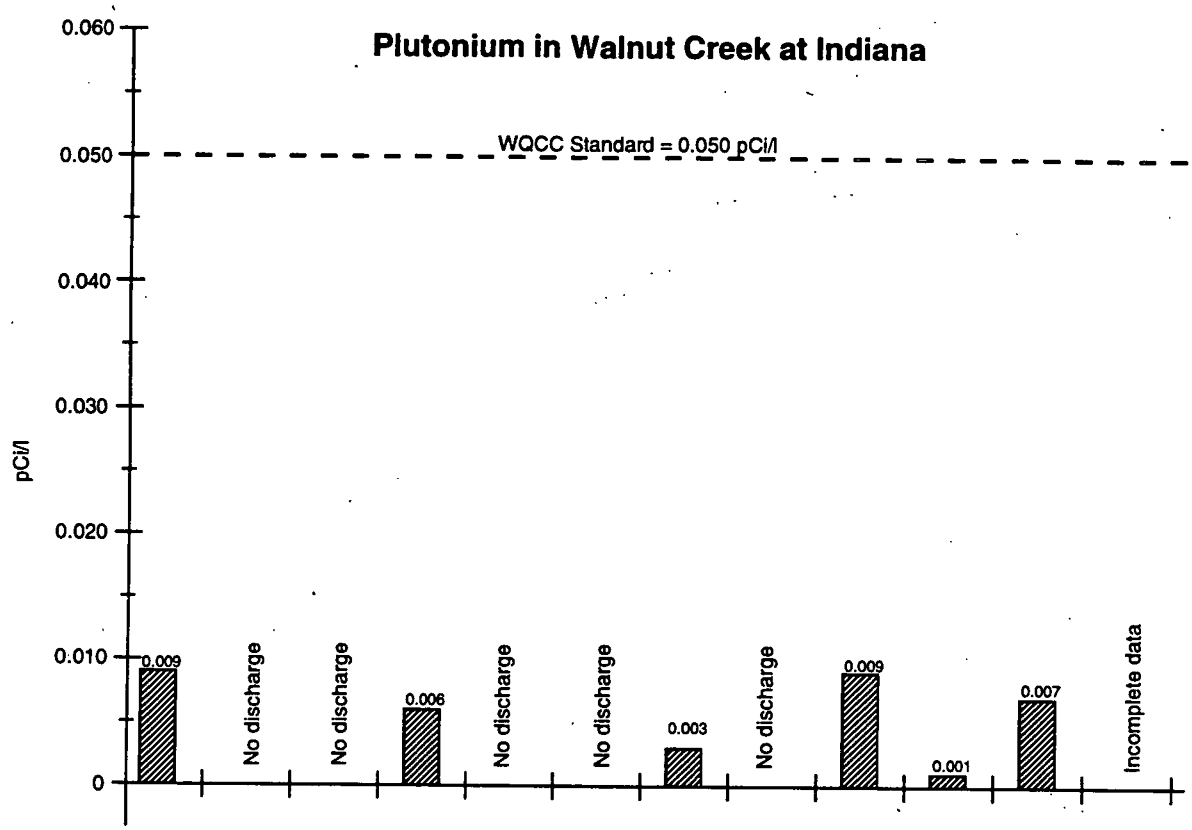
Plutonium in Walnut Creek at Indiana
WQCC Standard = 0.050 pCi/l
pCi/l
0.060
0.050
0.040
0.030
0.020
0.010
0
0.009
No discharge
No discharge
0.006
No discharge
No discharge
0.003
No discharge
0.009
0.001
0.007
Incomplete data

Table 6

Onsite Surface Water Sample Results - Tritium

		Tritium (pCi/l)		
Location	Number of Samples	C Minimum	C Maximum	C Average
Pond A-4[a]	26	b	b	b
Pond B-5[a]	22	b	b	b
Pond C-1	4	-140 ± 160	140 ± 170	120 ± 120
Pond C-2[a]	19	b	b	b
Walnut at Indiana[a]	31	b	b	b

a Volume weighted average concentration.
b Incomplete lab analysis

31

3.2 Nonradionuclide

Rocky Flats conducts sitewide surface water sampling programs to monitor discharges from detention ponds, evaluate potential contaminant releases, and characterize baseline water quality. Nonradioactive parameters requirements for this monitoring are derived from the NPDES permit as modified in March 1991 by the NPDES/FFCA. The NPDES/FFCA permit sets limits for nonradioactive pollutants in effluent water from federal facilities.

The EPA has issued to the Rocky Flats an NPDES permit for control of surface water discharges. The Rocky Flats NPDES permit establishes effluent limitations for seven surface water discharge points that may discharge into drainages leading off of Rocky Flats.

Surface water sampling results associated with the NPDES/FFCA permit are reported in Table 7. Applicable NPDES/FFCA limits are included in Table 7 for comparison. Monitoring results for which no limits have been established under the NPDES/FFCA are reported in Table 8. Analytical results for nonradioactive parameters in water at Walnut Creek at the Indiana Street location are summarized in Table 9.

Table 7

NPDES/FFCA Permit Surface Water Sample Results

Discharge 001-A (Pond B-3) - Continuous discharge 05/01/95 - 05/31/95

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Max. 7-Day Average	Limit Max. 7-Day Average
Nitrate	mg/l	2.5	10	2.8	20

				Measured Maximum	Limit Maximum
Total Residual Chlorine	mg/l			0.18	0.5

Discharge 001-B (Sewage Treatment Plant) - Continuous discharge 05/01/95 - 05/31/95

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Maximum	Limit Maximum
CBOD$_5$	mg/l	2.4	10	8.4	25
Total Phosphorus	mg/l	2.1	8	4.3	12
Total Chromium	mg/l	<0.004	0.05	<0.004	0.10

		Measured 30-Day Average	Limit 30-Day Average	Measured Max. 7-Day Average	Limit Max. 7-Day Average
Fecal Coliforms	#/100 ml	<5(Geometric)	200 (Geometric)	<17(Geometric)	400 (Geometric)
Total Suspended Solids	mg/l	<9	30	<20	45

		Measured Minimum	Limit Minimum	Measured Maximum	Limit Maximum
pH	SU	7.0	6.0	7.5	9.0

		Observed Sheen	Limit Sheen
Oil and Grease		No visual	No visual

Discharge 002 (Pond A-3) - Continuous discharge 05/01/95 - 05/05/95 and 05/17/95 - 05/31/95

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Maximum	Limit Maximum
Nitrates as N	mg/l	1.6	10	2.5	20

		Measured Minimum	Limit Minimum	Measured Maximum	Limit Maximum
pH	SU	6.8	6.0	8.5	9.0

33

Table 7(Continued)

NPDES/FFCA Permit Surface Water Sample Results (Continued)

Discharge 003 (Reverse Osmosis Pilot Plant) and Discharge 004 (Reverse Osmosis Plant) are inactive outfalls and will be eliminated from the new NPDES permit.

Discharge 005 (Pond A-4) - Continuous discharge 05/01/95 - 05/09/95 and 05/17/95 - 05/31/95

Parameters		Measured Maximum	Limit Maximum
Total Chromium	mg/l	<0.004	0.05

Discharge 006 (Pond B-5)- Continuous discharge 05/01/95 - 05/07/95 and 05/17/95 - 05/31/95

Parameters		Limit 30-Day Average		Limit Max. 7-Day Maximum
Nitrate as N[a]	mg/l	10		20
		Measured Maximum	**Limit Maximum**	
Total Residual Chlorinea	mg/l		0.5	
Total Chromium	mg/l	<0.004	0.05	

Discharge 007 (Pond C-2) - Continuous discharge 05/18/95 - 05/31/95

Parameters		Measured Maximum	Limit Maximum
Total Chromium	mg/l	<0.004	0.05

a These parameters are measured only in the event that Waste Water Treatment Plant effluent bypasses Pond B-3 and Flows directly into Pond B-5.

34

Table 8

NPDES/FFCA Effluent Monitoring

Discharge 001-A (Pond B-3) - Continuous discharge 05/01/95 - 05/31/95

Parameters	Unit	Measured Maximum	Measured 30-Day Average
BOD_5	mg/l	18.5	10.0
$CBOD_5$	mg/l	4.2	2.1
Total Suspended Solids	mg/l	32	9

Discharge 001-B (Sewage Treatment Plant [STP]) - Continuous discharge 05/01/95 - 05/31/95

Parameters	Unit	Measured Maximum	Measured 30-Day Average
Total Residual Chlorine	mg/l	0.38	0.04

Whole Effluent Toxicity[a] Sampled quarterly; data reported in 3/95
Ceriodaphnia % Eff to LC50:
Fathead Minnows % EFF to LC50:

	Unit		Measured Concentration
Metals	μg/l		
Metals were sampled on 05/03/95			
Antimony			<27.0
Arsenic			<1.0
Beryllium			<1.0
Cadmium			<0.1
Copper			<3.0
Iron			121
Lead			<1.0
Manganese			27.0
Mercury			<0.2
Nickel			<9.0
Silver			0.21[b]
Zinc			24.5

		PQL[c]	Concentrations that were above PQL
Volatile Organic Compounds (VOCs)	μg/l		
No compounds found above PQL			

35

Table 8 (Continued)

NPDES/FFCA Effluent Monitoring (Continued)

Discharge 003 (Reverse Osmosis Pilot Plant) and Discharge 004 (Reverse Osmosis Plant) are inactive outfalls and will be eliminated from the new NPDES permit.

Discharge 005 (Pond A-4) - Continuous discharge 05/01/95 - 05/09/95 and 05/17/95 - 05/31/95

Whole Effluent Toxicity		Sampled quarterly; data reported 3/95
	Ceriodaphnia	% EFF to LC50:
	Fathead Minnows	% EFF to LC50:

Discharge 006 (Pond B-5) - Continuous discharge 05/01/95 - 05/07/95 and 05/17/95 - 05/31/95

Whole Effluent Toxicity[a]		Sampled quarterly; data will be reported 6/95
	Ceriodaphnia	% EFF to LC50:
	Fathead Minnows	% EFF to LC50:

Discharge 007 (Pond C-2) - Continuous discharge 05/18/95 - 05/31/95

Whole Effluent Toxicity[a]		Sampled quarterly; data will be reported 6/95
	Ceriodaphnia	% EFF to LC50:
	Fathead Minnows	% EFF to LC50:

a Results for whole effluent toxicity are given in percentage of effluent sample that will cause mortality to half the test result organisms within the time frame of the test. For example, >100 percent indicates that 100 percent pure effluent did not cause acute toxicity to at least half of the organisms. A lower percentage LC_{50} (lethal concentration to 50 percent of test organisms) indicates a greater toxic effect since less of the sample is required to observe a sufficiently extensive adverse effect.

b The absolute value of the analyzed result is less than the Contract Required Detection Limit (CRDL).

c PQL (Practical Quantitation Limit) is equal to ten times the Method Detection Limit and represents the quantity at which 70 percent of laboratories can report in the 95 percent confidence interval.

Table 9

Surface Water Sample Results - Nonradioactive Parameters

Walnut Creek and Indiana Street Gaging Station

Parameter	Unit	Number of Samples	C Minimum	C Maximum	C Average
pH	SU	31	6.5	8.3	N/A
Nitrates as N	mg/l	31	a	a	a

a Incomplete lab analysis.

3.3 Flow

Daily flow data for surface water from the two plant drainage systems (Walnut Creek and Woman Creek) are presented in Tables 10 and 11. The current NPDES/FFCA permit requires flow measurement for terminal ponds when discharged offsite (A-4, B-5, and C-2). Other flow data are reported for informational purposes.

Daily flow data for water transferred from Pond B-5 to Pond A-4 for subsequent discharge offsite are given in Table 12. Discharges from Pond A-4, which include transfers from Pond B-5, enter Walnut Creek and are diverted around Great Western Reservoir through the Broomfield Diversion Ditch. Discharges from Pond C-2 are pumped through a pipeline into the Broomfield Diversion Ditch and also diverted around Great Western Reservoir.

Table 10

Daily Flow Data Recorded at the Walnut Creek and Indiana Street Gaging Station, Pond A-4 ,and Pond B-5

Date	Walnut Creek and Indiana (Gallons)	Pond A-4 (Gallons)	Pond B-5 (Gallons)
05/01/95	6,513,000	2,180,000	1,890,000
05/02/95	9,034,000	2,290,000	2,750,000
05/03/95	10,449,000	2,150,000	1,090,000
05/04/95	11,012,000	2,250,000	1,160,000
05/05/95	10,316,000	2,100,000	960,000
05/06/95	11,790,000	2,020,000	900,000
05/07/95	10,179,000	1,300,000	890,000
05/08/95	9,324,000	1,540,000	No Discharge
05/09/95	10,987,000	480,000	
05/10/95	9,492,000	No Dischage	
05/11/95	8,974,000		
05/12/95	10,987,000		
05/13/95	10,987,000		
05/14/95	10,987,000		
05/15/95	10,987,000		
05/16/95	10,987,000	No Discharge	No Discharge
05/17/95	38,779,000*	680,000	8,000,000
05/18/95	7,756,000	1,740,000	1,940,000
05/19/95	7,756,000	2,400,000	2,520,000
05/20/95	7,756,000	2,640,000	1,860,000
05/21/95	7,561,000	2,300,000	1,250,000
05/22/95	7,756,000	2,420,000	1,180,000
05/23/95	8,006,000	2,340,000	1,310,000
05/24/95	7,756,000	2,340,000	2,890,000
05/25/95	7,361,000	2,500,000	1,240,000
05/26/95	7,756,000	2,290,000	1,200,000
05/27/95	7,756,000	2,200,000	2,990,000
05/28/95	7,071,000	2,070,000	1,660,000
05/29/95	7,756,000	2,200,000	1,810,000
05/30/95	8,525,000	2,000,000	1,300,000
05/31/95	7,109,000	1,950,000	1,500,000
Total	309,465,000	48,380,000	42,290,000

* Volume is estimated.

39

Table 11

Daily Flow Data Recorded at Ponds C-1 and C-2 (Woman Creek)

Date	Pond C-1 (Gallons)	Pond C-2 (Gallons)
05/01/95	6,463,000	No Discharge
05/02/95	6,334,000	
05/03/95	7,756,000	
05/04/95	7,109,000	
05/05/95	5,817,000	
05/06/95	5,558,000	
05/07/95	5,752,000	
05/08/95	5,752,000	
05/09/95	3,425,000	
05/10/95	459,000	
05/11/95	905,000	
05/12/95	569,000	
05/13/95	465,000	
05/14/95	840,000	
05/15/95	614,000	
05/16/95	776,000	
05/17/95	60,107,000*	No Discharge
05/18/95	1,551,000	310,000
05/19/95	6,334,000	1,040,000
05/20/95	3,619,000	1,170,000
05/21/95	905,000	1,220,000
05/22/95	601,000	1,180,000
05/23/95	9,048,000	1,140,000
05/24/95	12,926,000	1,190,000
05/25/95	7,756,000	1,180,000
05/26/95	7,109,000	1,200,000
05/27/95	20,682,000	1,180,000
05/28/95	14,865,000	1,090,000
05/29/95	11,634,000	1,220,000
05/30/95	9,048,000	1,120,000
05/31/95	7,109,000	1,260,000
Total	232,888,000	15,550,000

* Volume is estimated.

Table 12

Daily Transfer Flow Data Recorded for Pond B-5 to Pond A-4

Date	Pond B-5 to Pond A-4 (Gallons)
05/01/95	No Transfer
05/02/95	
05/03/95	
05/04/95	
05/05/95	
05/06/95	
05/07/95	
05/08/95	
05/09/95	
05/10/95	
05/11/95	
05/12/95	
05/13/95	
05/14/95	
05/15/95	
05/16/95	
05/17/95	
05/18/95	
05/19/95	
05/20/95	
05/21/95	
05/22/95	
05/23/95	
05/24/95	
05/25/95	
05/26/95	
05/27/95	
05/28/95	
05/29/95	
05/30/95	
05/31/95	No Transfer
Total	No Transfer

41

4. Groundwater

Underlying Rocky Flats is a series of stratigraphic units that include surface deposits (i.e., recent valley fill and loose rock debris), the Rocky Flats Alluvium, Arapahoe Formation, Laramie Formation, Fox Hills Sandstone, and Pierre Shale (Figure 5). The Rocky Flats Alluvium and weathered portions of the Arapahoe Formation are in hydraulic connection and together with colluvium and other alluvium, represent the uppermost aquifer in the area.

The Rocky Flats Alluvium is composed of cobbles, coarse gravel, sand, and gravely clay, varying in thickness across Rocky Flats from approximately 103 feet on the west side, to less than 10 feet in the central area, and 45 feet on the east side of the Site. The Arapahoe Formation is approximately 102 feet thick in the area of Rocky Flats and consists of fluvial claystone overbank deposits and lesser amounts of sandstone channel deposits. The sandstones range from very fine grained to conglomeratic.

In the spring and early summer, the Rocky Flats Alluvium and Arapahoe Formation are recharged by precipitation and groundwater lateral flow. In late summer and early fall, recharge is primarily by groundwater lateral flow. In the stream drainages, groundwater discharges at seeps located at the base of the Rocky Flats Alluvium and where individual sandstone lenses are exposed at the surface.

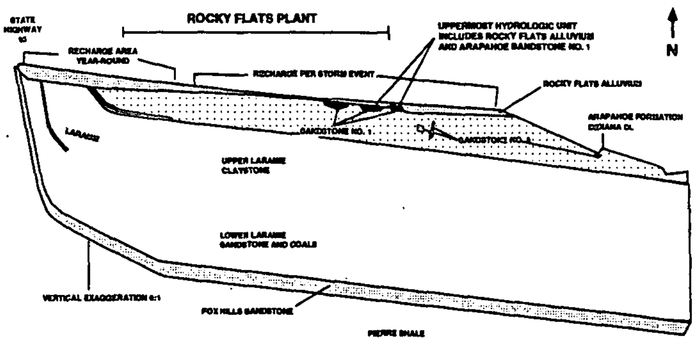

Figure 5: Generalized Cross Section of the Stratigraphy Underlying Rocky Flats

Groundwater samples are collected quarterly from a network of more than 400 alluvial and bedrock wells located across the Site (Figure 6). Samples are analyzed at several offsite laboratories for a wide variety of parameters, including dissolved metals, total metals, organics, dissolved radionuclides, total radionuclides, indicators (total dissolved solids and pH), several field parameters (including temperature, dissolved oxygen, alkalinity, and specific conductance), and anions (such as carbonate, bicarbonate, chloride, sulfate, etc.). Wells are spatially distributed to provide the coverage necessary to meet requirements of the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and Site protection guidelines for monitoring groundwater at hazardous waste sites. Some wells are used to help characterize hydrogeologic conditions at Rocky Flats, whereas others are used to monitor background groundwater quality.

Wells are subdivided into six subsets based on purpose and regulatory requirements:

- Background wells monitor the groundwater in areas upgradient of, or cogradient with Rocky Flats.
- RCRA regulatory wells characterize and/or monitor the uppermost aquifer for RCRA units.
- RCRA characterization wells characterize and/or monitor aquifers other than the uppermost aquifer at or near RCRA units.
- CERCLA wells characterize and/or monitor the groundwater for CERCLA units.
- Boundary wells monitor the movement and quality of groundwater at the downgradient boundaries of Rocky Flats.
- Special purpose wells include other wells installed to characterize groundwater and hydrogeology for a variety of other purposes.

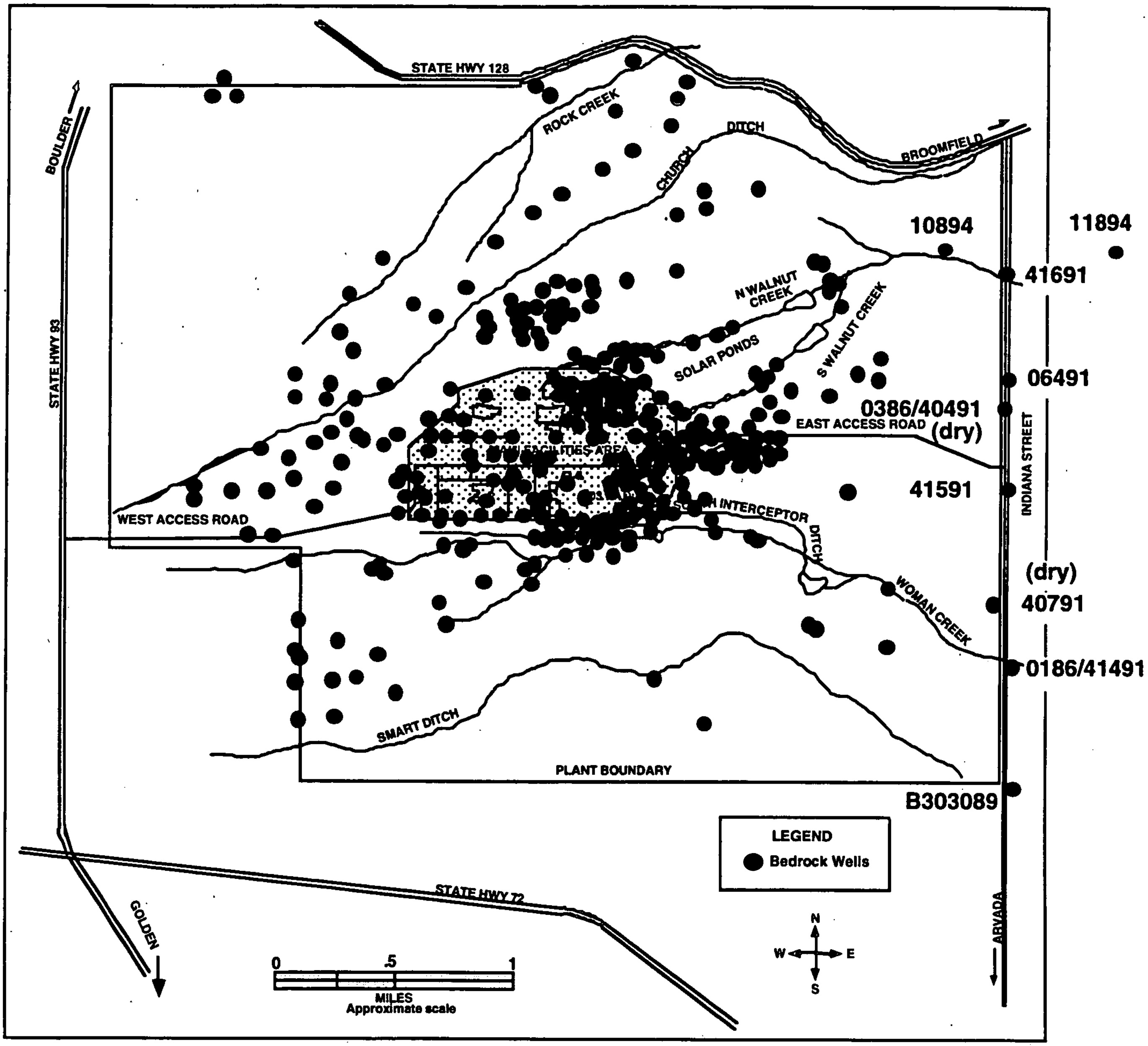

Figure 6: Location of Groundwater Monitoring Wells

Groundwater Data

Boundary well monitoring data are reported quarterly. Results from the Fourth Quarter of 1994 were presented in the April 1995 edition of the Monthly Environmental Monitoring Report. First Quarter 1995 data are scheduled to be reported in July 1995.

5 . Meteorology and Climatology

Meteorological data are measured routinely at Rocky Flats from instrumentation that is mounted on a 61-meter (200-foot) tower located in the western portion of the buffer zone at an elevation of 1,870 meters (6,140 feet) above sea level. The frequency of wind direction and speed during May 1995 are shown in Table 13. The compass points indicate the direction *from* which the wind blows. Day and night wind roses display these frequencies graphically in Figure 7 to illustrate the large diurnal wind changes. The wind rose sectors also represent the direction *from* which the the wind blows (i.e., wind blows toward the center).

The distribution of winds at the Site during May 1995 indicates predominant large-scale wind from the northerly sectors. The most frequent wind direction was northerly. All sectors from west-southwest through north-northeast experienced a small percentage of speeds over 8.0 m/s (17.9 mph). Speeds of 4.0 to 8.0 m/s (9.0 mph to 17.9 mph), from these directions, accounted for the month's highest frequency of occurrence. Most frequent during daytime hours were north and north-northeast winds at 4.0 to 8.0 m/s. As usual, nighttime wind directions and higher velocities favored the westerly sectors. Nighttime winds from west-northwest were observed most frequently. This month, as is normally the case, low-level drainage down the Rocky Flats slope accounted for the frequent westerly breezes at night. This direction was also responsible for the most frequent occurrence of highest sustained wind velocities. Wind velocities exceeding 8 m/s from the west-northwest were experienced during 0.91 percent of the month. Atypical of the spring, May 1995 did not experience any preference for daytime winds from the easterly sectors. When synoptic conditions are weak, as is the case for most of the summer, early fall, and periods during winter and spring, upslope breezes from the easterly sectors are generated by strong diurnal heating of the foothills. Synoptic conditions most favorable for local breezes are found when surface high pressure resides over the northern or central plains states. During the warm season, these light or moderate thermally driven winds flow up the Rocky Flats slope from the southeast and are the most common daytime wind. When a ridge of high pressure aloft is centered over the central Rocky Mountain region, diurnal easterly winds can be common during the cold season as well. This May experienced a relatively low 5.47 percent of the month with westerly winds. Average for May is about 10 percent. This infrequency of westerly winds was due to the very frequent passage of storms and frontal systems. For nearly the entire month, a large trough in the upper-atmosphere persisted

46

over the intermountain region. Smaller disturbances moving through the trough were responsible for prolonged flow from the northerly sectors.

May 1995 was the second month in a row with well below normal temperatures and much above average precipitation. Precipitation was 2.7 times the 35-year monthly average, making this May the second wettest on record.

Weather conditions for May 1995 are summarized as follows. The very active jet stream of April continued through May. A very strong belt of westerlies flowing from the northeast Pacific into the intermountain region brought a continuous succession of disturbances into Colorado. After a series of light-to-moderate precipitation events and below normal temperatures during the first two weeks of May, a "15-year" rainfall event was recorded from the 16th to the 17th. A 15-year event means that there is only a 7.5 percent chance, on any given year, of receiving the nearly 3.6 inches (9.1 cm) of water that was measured during a 24-hour period, from the 16th to the 17th. May 23rd experienced the lowest high temperature on record for that date. Three inches (7.6 cm) snowfall was measured on the evening of the 23rd. Measurable precipitation was recorded on all of the last 12 days of May 1995. Three of the precipitation events exceeded 0.50 inches (1.3 cm).

The polar jet stream was situated over Colorado on a few occasions, which caused strong downslope winds. Strong westerly winds, with the month's peak gust reaching 60.4 mph (27.0 m/s), occurred on the 13th. The mean wind speed during May 1995 was 8.2 mph (3.7 m/s). The 22-year monthly average is 9.5 mph (4.2m/s).

The high temperatures exceeded 70.0°F (21.1°C) on only three days, with the monthly maximum, 76.9°F (24.9°C), being reached on the 14th. The mean temperature was 47.1°F (8.4°C), or about 6.5°F (3.6°C) below normal. High temperatures averaged about 6.2°F (3.5°C) below normal, while overnight low temperatures were 7.5°F (4.2°C) below normal. The month's coldest reading, 27.8°F (-2.3°C), was measured on the morning of the 24th.

Precipitation totalled 7.65 in. (19.40 cm). The 24-year normal for May is 2.79 in. (7.10 cm). The monthly snowfall was 3.0 inches (7.6 cm). This is probably close to May's average. Snowfall this winter season was well above normal, totalling about 114.0 inches (289.6 cm).

47

Table 13

Wind Direction Frequency (Percent)

(Fifteen-Minute Averages - May 1995)

Wind Direction	Calm	1-2 (m/s)	2.5-4 (m/s)	4-8 (m/s)	>8 (m/s)	Total (m/s)
N	-	2.20	2.41	4.81	0.42	9.84
NNE	-	2.30	2.75	3.76	0.42	9.23
NE	-	2.30	2.16	1.95	0.03	6.44
ENE	-	1.99	2.93	0.87	0.03	5.82
E	-	1.71	2.79	0.84	0.00	5.34
ESE	-	1.92	1.53	0.91	0.00	4.36
SE	-	2.06	1.12	1.01	0.35	4.54
SSE	-	1.32	0.94	0.70	0.14	3.10
S	-	1.57	1.36	0.63	0.03	3.59
SSW	-	1.50	1.64	1.25	0.00	4.39
SW	-	1.57	1.95	1.29	0.10	4.91
WSW	-	1.50	2.16	2.27	0.35	6.28
W	-	1.99	1.74	1.32	0.42	5.47
WNW	-	2.47	2.93	2.93	0.91	9.24
NW	-	2.23	2.47	2.82	0.38	7.90
NNW	-	3.56	2.27	3.31	0.35	9.49
TOTAL		32.19	33.15	30.67	3.93	99.94

48

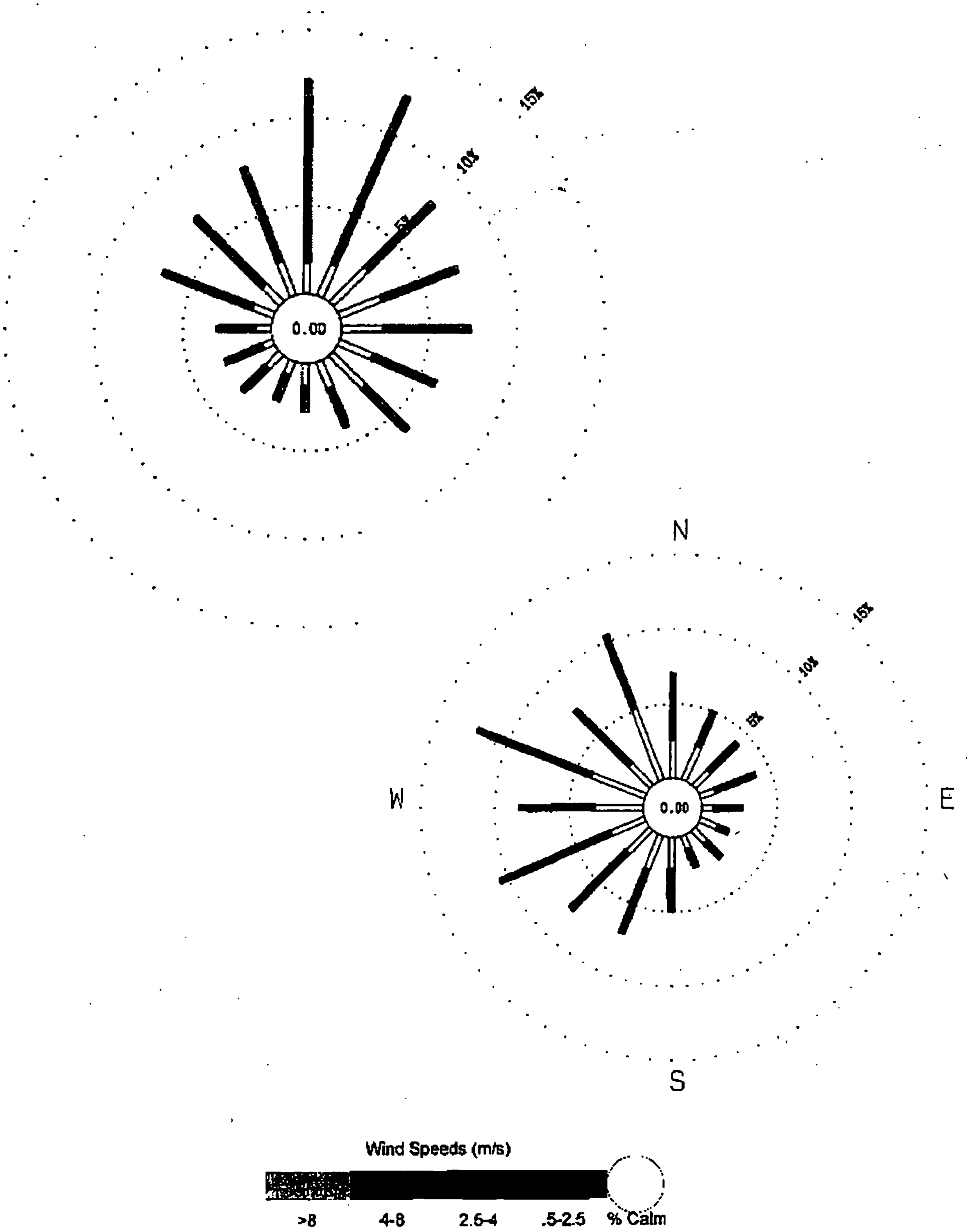

Figure 7: Daytime (top) and Nighttime (bottom) Wind Roses for the Rocky Flats Environmental Technology Site - May 1995

Table 14

Climatic Summary

	TEMPERATURE (deg. F)			DEW-POINT (deg. F)	REL HUM (%)	WIND SPEED (mph)		PRESS. (mb)	SOLAR (kW-h/m2)	WATER-EQUIV. PRECIP. (inches)		SNOW (inches)
Date	High	Low	Mean	Mean	Mean	Mean	Peak gust (1 sec.)	Mean	Total	Total	Peak (15 min.)	Total
5/1/95	51.49	33.69	42.59	33.28	66.65	8.39	25.84	811.53	6.04	0.00	0.00	0.00
5/2/95	51.96	29.41	49.53	38.70	63.24	6.26	27.40	804.10	3.68	0.12	0.08	0.00
5/3/95	47.10	32.70	39.90	38.12	92.59	8.86	23.20	809.80	2.48	0.21	0.03	0.00
5/4/95	60.12	28.63	44.38	35.15	67.14	6.06	14.27	814.09	7.39	0.00	0.00	0.00
5/5/95	60.91	33.75	47.33	42.40	81.26	8.23	35.39	808.10	3.26	0.02	0.02	0.00
5/6/95	62.51	35.60	49.06	26.78	37.71	9.86	41.07	803.88	7.92	0.00	0.00	0.00
5/7/95	54.79	34.41	44.60	33.19	60.95	11.48	38.45	802.08	3.11	0.00	0.00	0.00
5/8/95	55.58	35.71	45.65	35.65	65.06	10.92	37.40	800.47	3.61	0.01	0.01	0.00
5/9/95	58.32	37.26	47.79	31.80	50.06	10.18	32.23	809.17	3.42	0.00	0.00	0.00
5/10/95	60.03	33.31	46.67	34.21	58.46	6.73	20.27	813.92	7.04	0.01	0.01	0.00
5/11/95	67.53	35.44	51.49	37.36	55.02	6.64	28.25	806.06	4.86	0.00	0.00	0.00
5/12/95	61.48	38.52	50.00	33.28	48.81	10.54	49.06	796.29	4.72	0.00	0.00	0.00
5/13/95	64.71	33.93	49.32	21.25	28.71	15.66	60.42	801.27	8.41	0.10	0.02	0.00
5/14/95	76.86	29.28	53.07	35.62	47.75	6.26	24.16	811.84	12.61	0.00	0.00	0.00
5/15/95	76.00	38.00	57.00	36.00	41.41	7.60	24.00	809.66	11.80	0.00	0.00	0.00
5/16/95	64.38	40.69	52.54	38.61	55.67	7.99	25.84	807.28	2.57	0.63	0.07	0.00
5/17/95	45.91	31.30	38.61	38.80	100.00	12.59	31.18	806.79	1.27	2.95	0.21	0.00
5/18/95	64.67	33.82	49.25	39.51	66.28	6.53	30.78	811.53	5.09	0.18	0.09	0.00
5/19/95	66.47	39.61	53.04	41.61	62.10	7.63	27.63	814.43	7.00	0.00	0.00	0.00
5/20/95	60.80	39.06	49.93	45.84	84.39	6.29	32.97	813.72	4.69	0.02	0.01	0.00
5/21/95	72.93	40.84	56.89	39.34	48.19	9.78	45.81	812.04	6.85	0.05	0.05	0.00
5/22/95	54.64	36.82	45.73	41.54	83.75	8.08	23.20	813.16	1.54	0.12	0.02	0.00
5/23/95	39.43	27.90	33.67	35.78	100.00	5.86	15.32	812.91	1.14	0.87	0.04	3.00
5/24/95	44.44	27.79	36.12	37.24	100.00	6.67	19.64	813.66	2.41	0.20	0.02	0.00
5/25/95	48.49	35.94	42.22	41.67	97.70	5.23	16.37	812.19	1.97	0.13	0.03	0.00
5/26/95	58.21	33.37	45.79	41.40	83.04	8.19	29.19	809.25	6.33	0.61	0.06	0.00
5/27/95	50.94	39.07	45.01	41.74	87.08	8.14	22.79	810.77	3.84	0.26	0.02	0.00
5/28/95	53.44	40.80	47.12	41.68	79.49	5.97	25.84	815.92	4.32	0.70	0.09	0.00
5/29/95	53.11	39.61	46.36	45.03	94.58	6.38	22.06	815.61	2.24	0.19	0.02	0.00
5/30/95	52.29	40.08	46.19	44.15	91.81	8.01	19.84	814.57	4.31	0.11	0.01	0.00
5/31/95	67.80	39.18	53.49	43.07	64.90	8.88	34.14	813.60	6.12	0.16	0.06	0.00

MONTHLY TEMPERATURES					WIND SPEED		PRESS.	SOLAR	PRECIPITATION		SNOW
Mean High	Mean Low	Mean	Dew-point	Relative Humidity	Mean (mph)	Monthly Max.	Monthly Avg.	Monthly Total	Total	Monthly Max.	Total
58.30	35.34	47.11	37.74	69.80	8.25	60.42	809.67	152.04	7.65	0.21	3.00

50

Appendix A

Radiation Standards for Protection of the Public

Calculation of Potential Site Contribution to Public Radiation Dose

The primary standards for protection of the public from radiation are based on radiation dose. Radiation dose is a means of quantifying the biological damage or risk of exposure from ionizing radiation. The unit of radiation dose is the rem or the millirem (1 rem = 1,000 mrem). Radiation protection standards for the public are annual standards, based on the projected radiation dose from a year's exposure to or intake of radioactive materials.

Radiation dose is a calculated value. It is calculated by multiplying radioactivity concentrations in air and water or on contaminated surfaces by assumed intake rates (for internal exposures) or by exposure times (for external exposure to penetrating radiation), then by the appropriate radiation dose conversion factors. That is:

Radiation Dose = Radioactivity Concentration x
Intake Rate/Exposure Time x
Dose Conversion Factor

Radioactivity concentrations can be determined either by measurements in the environment or by calculations using computer models. These computer models perform airborne dispersion/dose modeling of measured building radioactivity effluents and estimated diffuse source term emissions (e.g., from resuspension of contaminated soil areas).

Assumed intake rates and dose conversion factors used are based on recommendations of national and international radiation protection advisory organizations, such as the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

Radioactive materials of importance in calculating radiation dose to the public from Rocky Flats activities include plutonium, uranium, americium, and tritium. Alpha radiation emissions from plutonium, uranium, and americium are primary contributors to the projected radiation dose.

DOE Radiation Protection Standards for the Public

ICRP-Recommended Standards for All Pathways:

Temporary Increase - 500 mrem/year Effective Dose Equivalent (with prior approval of DOE EH-2)

Normal Operations - 100 mrem/year Effective Dose Equivalent

EPA Clean Air Act Standards for the Air Pathway Only:

10 mrem/year Effective Dose Equivalent

51

DOE Derived Concentration Guides for Radionuclides of Interest at Rocky Flats

Air Inhalation:

Radionuclide	DCG (pCi/m³)
Plutonium-239, -240	0.02

Water Ingestion:

Radionuclide	DCG (pCi/l)
Plutonium-239, -240	30
Americium-241	30
Uranium-233, -234	500
Uranium-238	600
Tritium	2,000,000

Potential public radiation dose commitments, which could have resulted from Site operations and from background (i.e., non-Site) contributions, are calculated from average radionuclide concentrations measured at the DOE property boundary and in surrounding communities. Inhalation and water ingestion are the principal potential pathways of human exposure.

On February 8, 1990, DOE adopted DOE Order 5400.5, "Radiation Protection of the Public and the Environment," a radiation protection standard for DOE environmental activities (US 90). This standard incorporates guidance from the ICRP, as well as from the EPA Clean Air Act (CAA) air emission standards (as implemented in 40 CFR 61, Subpart H). Included in DOE Order 5400.5 is a revision of the dose limits for members of the public. Tables of radiation dose conversion factors currently used for calculating dose from intakes of radioactive materials were issued in July 1988 (US88a, US88b). The dose factors are based on the ICRP Publications 30 and 48 methodology and biological models for radiation dosimetry. The dose conversion factor tables and DOE Order 5400.5 are used for assessment of any potential Rocky Flats contribution to public radiation dose. On December 15, 1989, EPA published revised CAA air emission standards for DOE facilities (US89). The DOE radiation standards for protection of the public are given in this Appendix and include the December 15, 1989 EPA CAA air pathway standards.

DOE Derived Concentration Guides

Secondary radioactivity concentration guides can be calculated from the primary radiation dose standards and used as comparison values for measured radioactivity concentrations. DOE provides tables of these DCGs in DOE Order 5400.5. DCGs are the concentrations that would result in an EDE of 100 mrem from one year's chronic exposure or intake. In calculating air inhalation DCGs, DOE assumes that the exposed individual inhales 8,400 cubic meters of air at the calculated DCG during the year. Ingestion DCGs assume a water intake of 730 liters at the calculated DCG for the year. The table on this page lists the most restrictive air and water DCGs for the principal radionuclides of interest at the Rocky Flats.

Compliance with EPA Clean Air Act Standards

To determine compliance with the EPA air emissions standards, measured airborne effluent radioactivity emissions are entered into the EPA-approved atmospheric dispersion/dose calculation computer code, CAP88-PC, for calculation of the maximum radiation dose that an individual in the public could receive from the air pathway only.

52

For comparison with the annual radiation dose standards for protection of the public, the maximum annual EDE that a member of the public could receive as a result of Rocky Flats activities is typically less than 1 mrem, or less than 1 percent of the recommended annual standard for all pathways.

Dose Equivalent and Effective Dose Equivalent
Dose equivalent is a calculated value used to quantify radiation dose; it reflects the degree of biological effect from ionizing radiation. Differences in the biological effect of different types of ionizing radiation (e.g., alpha, beta, gamma, or x-rays) are accounted for in the calculation of dose equivalent.
EDE is a calculated value used to allow comparisons of total health risk (based primarily on the risk of cancer mortality) from exposures of different types of ionizing radiation to different body organs. It is calculated by first calculating the dose equivalent to those organs receiving significant exposures, multiplying each organ dose equivalent by a health risk weighing factor, and then summing those products. One millirem EDE from natural background radiation would have the same health risk as one millirem EDE from an artificially produced source of radiation.

References

US88a DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," United States Department of Energy, Asst. Secretary for Environment, Safety and Health, July 1988.

US88b DOE/EH-0071, "Internal Dose Conversion Factors for Calculation of Dose to the Public," United States Department of Energy, Asst. Secretary of Environment, Safety and Health, July 1988.

US89 United States Environmental Protection Agency, Code of Federal Regulations 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities," Washington, D.C., December 15, 1989.

US90 United States Department of Energy, DOE Order 5400.5, "Radiation Protection of the Public and the Environment," Washington, D.C., February 8, 1990.

54

Appendix B

National Pollutant Discharge Elimination System/Federal Facility Compliance Agreement - Volatile Organic Compounds

The following is a list of volatile organic compounds (VOCs) for which monitoring is required by the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System/Federal Facility Compliance Agreement (NPDES/FFCA).

Compound	PQL (μg/l)[a]	Compound	PQL (μg/l)
Benzene	5	1,3-dichloropropylene	5
Bromoform	5	Ethylbenzene	5
Methyl bromide	10	Methyl chloride	10
Carbon Tetrachloride	5	Methylene chloride	5
Chlorobenzene	5	1,1,2,2-tetrachloroethane	5
Chlorodibromomethane	5	Tetrachloroethylene	5
Chloroethane	10	Toluene	5
Chloroform	5	1,2-trans-dichloroethylene	5
Dichlorobromomethane	5	1,1,1-trichloroethane	5
1,1-dichloroethane	5	1,1,2-trichloroethane	5
1,2-dichloroethane	5	Trichloroethylene	5
1,1-dichloroethylene	5	Vinyl chloride	10
1,2-dichloropropane	5		

a PWL (Practical Quantitation Limit) is equal to 10 times the Method Detection Limit and represents the quantity at which 70 percent of laboratories can report in the 95 percent confidence interval.

5564

Appendix C

Colorado Water Quality Control Commission Standards

The Colorado Water Quality Control Commission (CWQCC) has finalized new standards for the Walnut Creek and Woman Creek drainages. The EPA has not yet written a new NPDES permit that reflects these standards; however, in the spirit of the Agreement in Principle (AIP) completed between the DOE and the State of Colorado, Rocky Flats is attempting to meet the standards at this time (Figure 8).

Standards for CWQCC are summarized in Table 17.

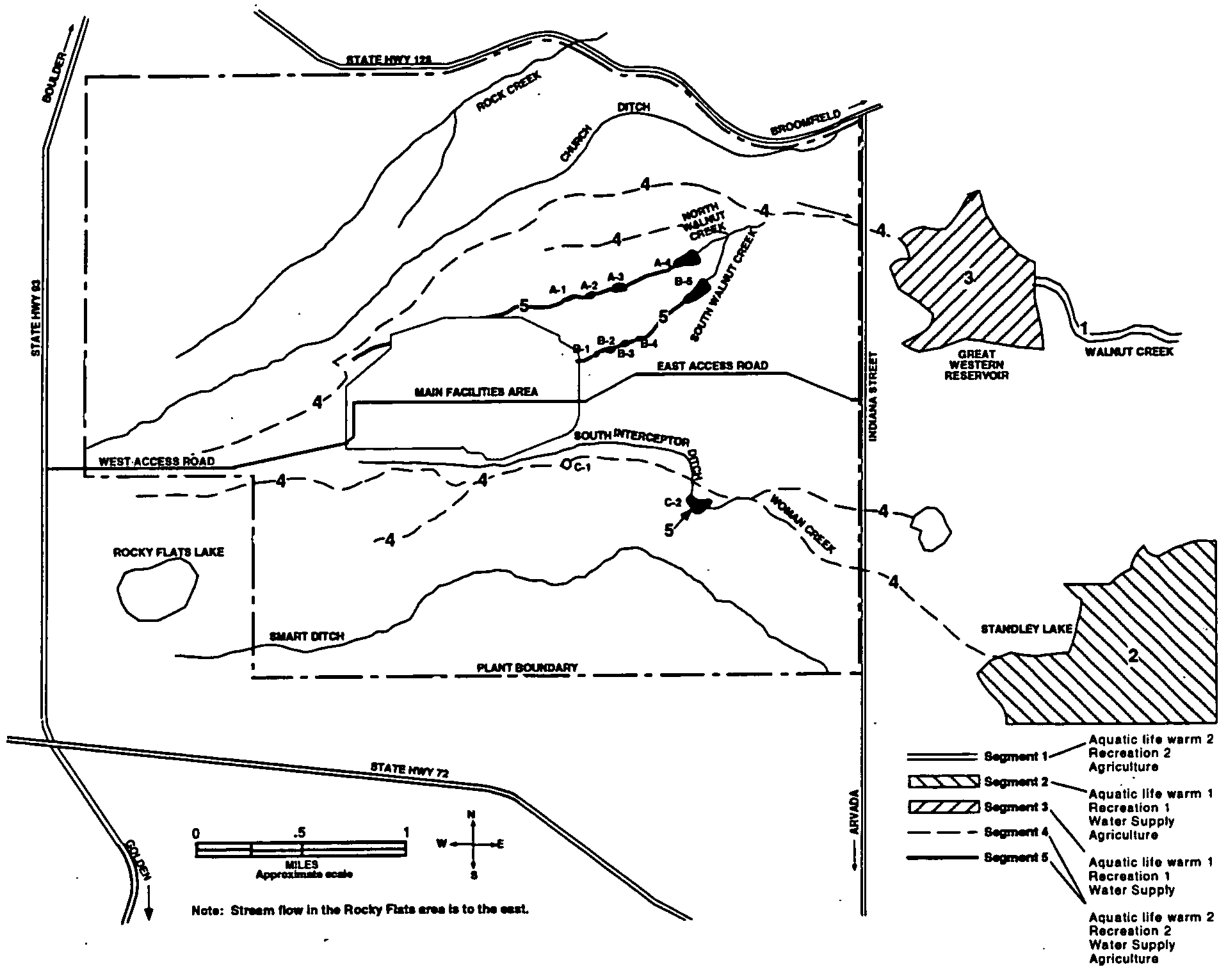

Figure 8: Stream Segmentation and Classification

56

Table 15

Water Quality Standards

Parameter	Segment 4/5 Acute Standard µg/l Aquatic Life Std	Segment 5 Chronic Standard µg/l See Footnotes	Segment 4 Chronic Standard µg/l See Footnotes	Footnotes
Organics				
Acenaphthene	1,700	520	520	c
Acenaphthylene		0.0028	0.0028	d,e
Acrolein	68	21	21	c
Acrylonitrile	7,500	0.058	0.058	d,e
Alachlor		2	2	b
Aldicarb		10	10	b
Aldicarb Sulfone		1	1	b
Alicarb Sulfoxide		4	4	b
Aldrin	1.5	0.00013	0.00013	d,e
Anthracene (PAH)		0.0028	0.0028	e,g
Atrazine		3	3	b,e
Benzene	5,300	1	1	b,d
Benzidine	2,500	0.00012	0.00012	d,e
Benzo(a)anthracene		0.0028	0.0028	e,g
Benzo(a)pyrene		0.0028	0.0028	e,g
Benzo(b)fluoranthene		0.0028	0.0028	e,g
Benzo(ghi)perylene		0.0028	0.0028	e,g
Benzo(k)fluoranthene		0.0028	0.0028	e,g
Bromodichloromethane		0.3	0.3	e,g
Bromoform		4	4	e,g
Butyl benzyl phthalate		3,000	3,000	d
Carbofuran		36	36	b
Carbon tetrachloride	35,200	18	0.25	d,f.
Chlordane	1.2	0.00058	0.00058	d,e
Chlorobenzene		100	100	b,d
Chloroethyl ether (BIS-2)		0.03	0.03	e,g
Chloroform	28,900	6.0	6.0	e,g
Chlorolspopropyl Ether (BIS-2)		1,400	1,400	d
4-Chloro-3-methylphenol	30	30	30	c
Chloromethyl ether (BIS)		0.0000037	0.0000037	e,g
Chloronapthalene 2	2,300	620	620	c
Chlorophenol 2	4,380	2000	2000	d
Chloropyrifos	0.083	0.041	0.041	c
Chrysene		0.0028	0.0028	e,g
DDD 4'4	0.6	0.00083	0.00083	d
DDE 4'4	1,050	0.001	0.001	d
DDT 4'4	0.55	0.00059	0.00059	d
Dalapon		200	200	b
Demeton		0.1	0.1	c,e
Dibenzo(a,h)anthracene		0.0028	0.0028	e,g
1,2 Dibromo-3-chloropropane		0.2	0.2	b
Dibromochloromethane		6	6	e,g
Dichlorobenzene 1,2		620	620	b,d
Dichlorobenzene 1,3		400	400	d
Dichlorobenzene 1,4		75	75	d
Dichlorobenzidine		0.039	0.039	d,e
Dichloroethane 1,2	118,000	0.4	0.4	b,d

57

Table 15 (Continued)

Water Quality Standards (Continued)

Parameter	Segment 4/5 Acute Standard µg/l Aquatic Life Std	Segment 5 Chronic Standard µg/l See Footnotes	Segment 4 Chronic Standard µg/l See Footnotes	Footnotes
<u>Organics (continued)</u>				
Dichloroethylene 1,1		0.057	0.057	d
Dichloroethylene 1,2-CIS		70	70	b
Dichloroethylene 1,2-Trans		100	100	b,d
Dichloromethane		5	5	b,d
Dichlorophenol 2,4	2,020	21	21	b,d
Dichlorophenoxyacetic Acid (2,4-d)		70	70	b,e
Dichloropropane 1,2	23,000	0.56	0.56	b,d
Dichloropropylene 1,3	6,060	10	10	d
Dieldrin	1.3	0.00014	0.00014	d,e
Diethyl phthalate		23,000	23,000	d
Diisopropyl methyl phosphonate		8	8	b
Dimethylphthalate		313,000	313,000	d
Dimethylphenol 2,4	2,120	2,120	2,120	d
Dinitro-o-cresole		13	13	d
Dinitrophenol 2,4		14	14	b,d
Dinitrotoluene 2,4		0.11	0.11	d
Dinitrotoluene 2,6	33	230	230	c
Dinoseb		7	7	b
Di(2-ethylhexyl) adipate		400	400	b
Di(2-ethylhexyl) Phthalate		6	6	b
Diquat		20	20	b
Dioxin (2,3,7,8-TCDD)	0.01	0.000000013	0.000000013	d,e
Diphenylhydrazine 1,2	270	0.04	0.04	d
Endosulfan	0.11	0.056	0.056	c,e
Endosulfan Sulfate		110	110	d
Endothall		100	100	b
Endrin	0.09	0.0023	0.0023	e
Endrin aldehyde		0.2	0.2	b,d
Ethylbenzene	32,000	680	680	b,d
Ethylhexyl phthalate (bis-2)		1.8	1.8	d
Ethylene Dibromide		0.05	0.05	b
Fluoranthene (PAH)	3,980	42	42	e,g
Fluorene		0.0028	0.0028	e,g
Glyphosate		700	700	b
Guthion		0.01	0.01	c,e
Heptachlor	0.26	0.00021	0.00021	d,e
Heptachlor epoxide	0.26	0.0001	0.0001	d
Hexachlorobenzene		0.00072	0.00072	e,g
Hexachlorobutadiene	90	0.45	0.45	d,e
Hexachlorocyclohexane, alpha (BHC)		0.0039	0.0039	d,e
Hexachlorocyclohexane, beta (BHC)		0.014	0.014	d,e
Hexachlorocyclohexane, gamma (BHC)	1.0	0.019	0.019	d,e
Hexachlorocyclohexane, technical (BHC)	100	0.012	0.012	d,e
Hexachloroethane	980	1.9	1.9	d,e
Hexachlororocyclopentadiene	7	5	5	c
Indeno(1,2,3-cd)pyrene		0.0028	0.0028	e
Isophorone		8.4	8.4	d

58

Table 15 (Continued)

Water Quality Standards (Continued)

Parameter	Segment 4/5 Acute Standard µg/l Aquatic Life Std	Segment 5 Chronic Standard µg/l See Footnotes	Segment 4 Chronic Standard µg/l See Footnotes	Footnotes
Malathion		0.1	0.1	c,e
Methoxychlor		0.03	0.03	c,e
Methyl bromide		48	48	d,e
Methyl chloride		5.7	5.7	d,e
Methylene chloride		4.7	4.7	e
Mirex		0.001	0.001	c,e
Naphthalene(PAH)	2,300	0.0028	0.0028	e,g
Nitrobenzene	27,000	3.5	3.5	b,d
Nitrosodinpropylamine-n		0.005	0.005	d
Nitrosodinbutylamine-n		0.0064	0.0064	d,e
Nitrosodiethylamine-n		0.0008	0.0008	d,e
Nitrosodimethylamine-n		0.00069	0.00069	d,e
Nitrosodiphenylamine-n		4.9	4.9	e,g
Nitrosopyrrolidine-n		0.016	0.016	d,e
Oxamyl(vdate)		200	200	b
Parathion		0.4	0.4	e,g
PCBs	2.0	0.000044	0.000044	d,e
Pentachlorobenzene		6	6	d
Pentachlorophenol	exp[1.005(pH)-4.83]	5.7	5.7	d
Phenanthrene		0.0028	0.0028	d,e
Phenol	10,200	2,560	2,560	
Picloram		500	500	b
Pyrene		0.0028	0.0028	e,g
Simazine		4	4	b,e
Styrene		100	100	b
Tetrachlorobenzene 1,2,4,5		2	2	b
Tetrachloroethane 1,1,2,2		0.17	0.17	d,e
Tetrachloroethylene		76	0.8	d,e,f
Toluene	5,280	1000	1000	b,d
Toxaphene	18,500	0.0002	0.0002	c,e
Trichlorobenzene 1,2,4	250	50	50	c
Trichloroethane 1,1,1	0.73	200	200	b,d
Trichloroethane 1,1,2		0.6	0.6	d,e
Trichloroethylene	45,000	66	2.7	d,f
Trichlorophenol 2,4,5		700	700	b,d,e
Trichlorophenol 2,4,6		2.0	2.0	b,e
Trichlorophenoxypropionic (2,4,5-tp)		50.0	50.0	b,d
Trihalomethanes (total)		100.0	100.0	b,d
Vinyl Chloride		2	2	b
Xylenes (total		10,000	10,000	b

a Statewide agricultural standard.
b Statewide water supply standard.
c Site-specific standard.
d Statewide human health based water + fish standard applicable to aquatic life segments.
e Sit- specific standard.
f Segment 5 temporary modification is effective until April 1, 1996.
g Site specific standard is more restrictive than any statewide standard.

Table 15 (Continued)

Water Quality Standards (Continued)

Parameter	Aquatic Life	Agriculture	Drinking Water Supply	Water + Fish	Add'l Segment 4/5 Standards
Metals (concentrations in μg/l)					
Aluminum	Acute - 750 (d) Chronic - 87 (d)				
Antimony			6.0 (TR) (30 day average)	6.0 (d)	
Arsenic	Acute = 360 (d) Chronic - 150 (d)	100 (TR) (30 day average)	50 (TR)* (daily maximum)		
Barium			1,000 (TR) (daily maximum)		
Beryllium		100 (TR) (30 day average)	4 (TR) (30 day average)		
Cadmium	Acute=TVS=14.8(d)* Chronic=TVS=1.5(d)*	10 (TR) (30 day average)	5 (TR) (daily maximum)		
Chromium III	Acute=TVS=2327(d) Chronic=TVS=227(d)	100(TR) (30 day average)	50(TR)* (daily maximum)		
Chromium VI	Acute=16(d)* Chronic=11(d)*	100(TR) (30 day average)	50(TR) (daily maximum)		
Copper	Acute=TVS=24.8(d)* Chronic=TVS=16(d)*	200(TR)	1,000(TR) (30 day average)		23(TR)* Segment 5 Temporary Modification**
Iron	Chronic=1,000(TR)*		300(d)* (30 day average)		13,200(TR) Segment 5 Temporary Modification**
Lead	Acute=TVS=170.8(d)* Chronic=TVS=6.5(d)*	100(TR) (30 day average)	50(TR) (daily maximum)		28(TR) Segment 5 Temporary Modification**
Manganese	Chronic=1,000(d)	200(TR) (30 day average)	50(d)* (30 day average)		Chronic=1,000(TR) 560(d) Segment 5 Temporary Modification**
Mercury	Acute=2.4(d) Chronic=0.1(d) Fish=0.01(total)*		2.0(TR) (daily maximum)		
Nickel	Acute=TVS=1,210(d)* Chronic=TVS=125.4* (d)*	200(TR) (30 day average)	100(TR) (30 day average)		
Selenium	Acute=135(d) Chronic=17(d)	20(TR) (30 day average)	50(TR) (30 day average)		Chronic=10(TR)*
Silver	Acute=TVS=3.8(d)*		100(TR) (daily maximum)		

60

Table 15(Continued)

Water Quality Standards (Continued)

Parameter	Aquatic Life	Agriculture	Drinking Water Supply	Water + Fish	Add'l Segment 4/5 Standards
Thallium	Chronic = 15(d)		0.5(TR) (30 day average)	0.5(d)	
Uranium	Acute=TVS=159(d) Chronic=2,226(d)	2,000(TR)			350(TR)
Zinc	Acute=TVS=159(d) Chronic=TVS=144(d)	2,000(TR) (30day average)	5,000(TR) (30 day average)		350(TR) Segment5 Temporary Modificaiton**

d = dissolved
TR = Total Recoverable
TVS = Table Value Standard calculated using the average hardness of 143 mg/l.
*Site specific standards and statewide standards which are Rocky Flats numeric standards.
**Temporary modifications for Big Dry Creek, Segment 5 only, effective until April 1, 1996.

61

Appendix D

Distribution

Federal Agencies

US DOE, RFFO
Attn: Shirley Olinger
Safety and Health Division
Acting Manager
Bldg. 116

US EPA
Attn: Dr. M. Lammering,
R. Rutherford
8 ART-RP
999 18th Street, Suite 500
Denver, CO 80202-2466

US EPA
Attn: B. Lavelle
999 18th Street, Suite 500
8 HWM-FF
Denver, CO 80202-2405

State Government Agencies

Colorado Water Conservation Board
Attn: N.C. Ioannides
823 State Centennial Building
1313 Sherman Street
Denver, CO 80203

Denver Regional Council of
Governments
Attn: L. Mugler
2480 W. 27th Avenue, #200B
Denver, CO 80211

Department of Natural Resources
Attn: R.W. Cattony
1313 Sherman Street
Denver, CO 80203

City Governments

City of Arvada
Utilities Division
Attn: M. Mauro
8101 Ralston Road
Arvada, CO 80002

City of Boulder
Office of the City Manager
Attn: J. Piper, A. Struthers
P.O. Box 791
Boulder, CO 80302

City of Broomfield
Attn: H. Mahan, K. Schnoor
#6 Garden Office Center
P.O. Box 1415
Broomfield, CO 80038-1415

City of Fort Collins
Office of the City Manager
Attn: S. Burkett
300 La Porte
Fort Collins, CO 80525

City of Northglenn
Attn: N. Renfroe
11701 Community Center Drive
Northglenn, CO 80233-1099

City of Thornton
Attn: Joel Meggers
9500 Civic Center Drive
Thornton, CO 80229-1120

City of Westminster
Attn: D. Cross, T. Settle
4800 W. 92nd Avenue
Westminster, CO 80030

Denver Water Department
Quality Control
Attn: J. Dice
1600 W. 12th Avenue
Denver, CO 80254

Health Departments

Boulder City/County Health
Department - Division of
Environmental Health
Attn: T. Douville, V. Harris
3450 Broadway
Boulder, CO 80302

Colorado Department of Public Health
and Environment
4300 East Cherry Creek Drive South
Denver, CO 80222-1530
Attn: J. Bruch, R. Fox, D. Holm,
E. Kray, R. Quillin, J. Sowinski

Colorado Department of Public Health
and Environment
Office of Environmental Multimedia
Focal Group
4300 East Cherry Creek Drive South
Denver, CO 80222-1530
Attn: S. Tarlton

Colorado Department of Public Health
and Environment
Public Information Center
4300 East Cherry Creek Drive South
Denver, CO 80222-1530
Attn: K. Juricek

Jefferson County Health Department
Attn: George Theophilos
260 South Kipling
Lakewood, CO 80226-1099

Tri-County District Health
Attn: S. Salyards
4301 E. 72nd Avenue
Commerce City, CO 80022

Environmental

Advance Sciences, Inc.
Attn: Jim Kunkel, L. Host
405 Urban Street, Suite 401
Lakewood, CO 80228

W. Gale Biggs Associates
Attn: Dr. W. Gale Biggs
P.O. Box 3344
Boulder, CO 80307

F.H. Blaha
2303 Table Heights Drive
Golden, CO 80401

62

L.C. Holdings
Attn: M. Jones
5650 York Street
Commerce City, CO 80022

IT Corporation
Attn: C. Rayburn
5600 S. Quebec, Suite 280D
Englewood, CO 80111

National Renewable Energy Laboratory
Attn: Debbie Anidaneau, Env. Mgr.,
R. Noun
1617 Cole Blvd.
Golden, CO 80402

PRC Environmental Management, Inc.
Attn: R.J. Fox
1099 18th Street, Suite 1960
Denver, CO 80202

Rocky Flats Citizens Advisory Board
Attn: G. Swartz
9035 Wadsworth Blvd., #2250
Broomfield, CO 80021-4541

Rocky Flats Cleanup Commission
Attn: K. Korkia
1738 Wynkoop, Suite 302
Denver, CO 80202

Sierra Club - Rocky Mountain Chapter
Attn: Dr. E. DeMayo
11684 Ranch Elsie Road
Golden, CO 80203

Wright Water Engineers
Attn: J. Jones, P. Pinson
2490 W. 26th Avenue, Suite 100A
Denver, CO 80211-4208

Other

[redacted]

[redacted]

T.T. Matsuo
11746 W. 74th Way
Arvada, CO 80005

R.D. Morgenstern
3213 W. 133rd Avenue
Broomfield, CO 80020

J.K. Natale
11767 W. 74th Way
Arvada, CO 80005

National Center for Atmospheric Research
Attn: S. Sadler
P.O. Box 3000
Boulder, CO 80307-3000

L.S. Newton
5993 W. 75th Avenue
Arvada, CO 80003

Fluor Daniel
Attn: M. Peceny
1726 Cole Blvd., Suite 150
Golden, CO 80401

Physicians for Social Responsibility
Attn: T. Perry
1101 14th St. NW, Suite 700
Washington, D.C. 20005-5601

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[redacted]

[redacted]

[redacted]

EG&G Rocky Flats

S.J. Bender
Measurement & Analysis

M.C. Broussard, ERPD/EOM

E.A. Brovsky, General Chemistry

A.H. Burlingame, President

R.J. Crocker, Air Quality

J.A. Cuicci, Regulated Waste

S.L. Cunningham, Info. Security

N.S. Demos, ERM/Facility Operations

J.R. Dick, Analytical Labs

C.L. Dickerman, Air Quality

G.A. Dingman, Waste Quality Engineering

L.A. Doerr, Op. Health Physics

L.A. Dunstan, Surface Water

E.W. Ellis, Technical Development

M.J. Ely, Liquid Residue Management

Environmental Master File
c/o EPM/Records and Reporting

H.L. Gloe, Environmental Protection and Waste Reporting

G.R. Euler, Air Quality

B.Haynes Sample Management Division

T.G. Hedahl, Director Waste Management

M. Henry, Performance Meas. and Analysis

63

M.W. Hume, SIAM

D.I. Hunter, General Laboratory

H. Jordan, Nuclear Safety Engineering

M.R. Klueber, Ext. Dos.

E. Lee, Planning and Integration

R.D. Lindberg, ERM/Env. Science and Technology

F.G. McKenna, Chief Counsel

C.M. Madore, Environmental Protection and Waste Reporting

R.V. Morgan, Org. Effectiveness

M.A. Natzke, Environmental Protection and Waste Reporting

R.C. Nininger, Air Quality

R.W. Norton, Waste management & ER Radiation Control

J.B. Novy, Environmental Protection and Waste Reporting

J.G. Paukert, Director Communications

B.J. Pauley, Air Quality

L.C. Pauley, Air Quality

V.L. Peterson, Safety Analysis Engineering

D.R. Pierson, Pondrete Ops.

G.L. Potter, Regulatory Liaison

A.J. Read, Analytical Labs

C.D. Reno, Environmental Protection and Waste Reporting

Rocky Flats Environmental
Technology Site Public Reading Room
c/o Front Range Community College
3645 W. 112th Avenue
Westminster, CO 80037

R.S. Roberts, Group One Closures

C.M. Sanda, Community Relations

J.K. Schwartz, Media Communications

C.A. Sedlmayr, Administration

G.H. Setlock, Program Manager Environmental Protection Management

S. Schoeppe, Environmental Protection Management

T.A. Smith, Community Relations

D. Stein, Mechanical Utilities

M.T. Sullivan, Radiation Protection

P.V. Thomas, Environmental Protection and Waste Reporting

C. Trice, Analytical Labs

P.E. Wise, Project Development, Support, and Performance

J. Zarret, Analytical Labs

64 / 64